The Local Geography of Transnational Terrorism

Michael G. Findley
Dept of Government
University of Texas at Austin
mikefindley@austin.utexas.edu

Alex Braithwaite
School of Government & Public Policy
University of Arizona
abraith@arizona.edu

Joseph K. Young
School of International Service
American University
jyoung@american.edu

Josiah F. Marineau
Dept of Government
University of Texas at Austin
josiah.marineau@utexas.edu

Henry Pascoe
Dept of Government
University of Texas at Austin
hbpascoe@austin.utexas.edu

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Abstract

Why are some locations more attractive targets for transnational terrorism than others? Remarkably little is known about the local-level conditions and attributes that determine precisely where *transnational* terror attacks occur. To date, quantitative terrorism research identifies country- or region-level correlates of terrorism, neglecting possible local factors. In this study, we model explanatory factors across levels of analysis, grouping them in terms of vulnerability and value. Using a variety of estimation strategies, including multilevel models, we regress new subnational geographically coded transnational terrorism data on various vulnerability and value measures. The results demonstrate that although the country and region levels matter, numerous local-level conditions, such as where civil violence occurs, proximity to capitals and borders, and subnational economic activity are equally, if not more, important. The results have many implications for a large literature that provides primarily country- and region-level explanations for transnational terrorism.

Keywords: Transnational terrorism, geocoding, multilevel modeling, matching

Word Count: 9,810

On September 21, 2013, Al Shabab operatives attacked the Westgate shopping center in Nairobi, Kenya, killing over 65 individuals and injuring more than 200 others. Al Shabab targeted Kenya because the Kenyan government supported the fight against Islamist insurgents in Somalia. But they did not just choose any random location within Kenya. Instead, they chose a specific location in Nairobi that conferred a number of strategic advantages. Shopping centers in Nairobi, including the Westgate center, had previously been considered secure locations. Considerable numbers of consumers, including many westerners, frequent shopping centers like Westgate. Indeed, such malls reflect the heartbeat of an economically-vibrant, populous capital city. In other words, the Westgate shopping center represented an attractive target, because it was both vulnerable and valuable.

The kinds of locations targeted by notable terrorist attacks—what Arce and Sandler (2010) refer to as "terrorist spectaculars"— rarely surprise us, even if their outcomes do shock. Densely populated urban centers, areas of significant economic activity, and iconic political and religious sites all appear to make for attractive locations. Yet, most transnational terrorist attacks are not on the scale of the spectacular.[1] Accordingly, much less is said systematically about the location of the bulk of terrorist attacks. Indeed, we know that transnational terrorist attacks occur in all regions and a majority of countries globally; yet intuition tells us also that not all locations within each country are equally likely to host attacks.

Extant research highlights country- and region-level covariates of transnational terrorism (Enders and Sandler 2006, Li 2005, Piazza 2008), identifies cross-national clusters of terrorism in space and time (Braithwaite and Li 2007, LaFree, Morris, Dugan, and Fahey 2006, Johnson, Carran, Botner, Fontaine, Laxague, Nuetzel, Turnley, and Tivnan 2011), and demonstrates that transnational terrorism displays substitution—or spatial displacement—effects

[1] We follow the convention of distinguishing *transnational* terrorist attacks from *domestic* attacks as discussed in Enders, Sandler, and Gaibulloev (2011). We provide more detailed definitions below.

(Enders and Sandler 2006).[2] Remarkably little is known, however, about the local-level conditions and attributes that determine more precisely *where* transnational terrorism occurs within targeted countries.[3] To address the local level dimensions of transnational terrorism, we geocoded the most recent version of the International Terrorism: Attributes of Terrorist Events (ITERATE) dataset (Mickolus, Sandler, Murdock, and Flemming 2003) and merged those data with the lattice-based, PRIO-GRID dataset (Tollefsen, Strand, and Buhaug 2010).[4] Specifically, we claim that individual locations can be characterized in two respects that directly affect the likelihood that they will host terrorist attacks. First, locations vary in terms of the extent to which they facilitate or hinder the preparation and conduct of terrorism—we refer to these as *vulnerability* characteristics. Second, locations vary with respect to their *value* to potential attackers. We contend that the more vulnerable and/or valuable specific locations are, the more likely they are to experience increased levels of transnational terrorism relative to areas that are not vulnerable or valuable.

In order to test these local-level expectations, we regress our geocoded transnational terrorism data on a set of covariates that are operationalized as proxies for vulnerability and value. Each of these covariates is measured at the local (0.5 decimal degree x 0.5 decimal degree grid cell) level according to PRIO-GRID (Tollefsen, Strand, and Buhaug 2010). These indicators of value and vulnerability include measures of mountainous terrain, forest

[2]Numerous terms could be used to describe terrorist events at different levels. We use the terms "subnational" and "local" interchangeably to refer to factors specific to geographic areas *within* countries. Examples include civil war zones within a country. We use "country" and "national" to refer to characteristics of countries themselves. Examples include the level of democracy. We employ the term "region" or "transnational" to refer variably to country level characteristics of to broader regional dynamics that span more than one country. Examples could include interstate rivalries. It is worth noting that most literature on "transnational" terrorism exclusively uses country-level variables in their analyses.

[3]See Findley and Young (2012) and Nemeth, Mauslein, and Stapley (2014) for early attempts at identifying subnational variation in terror attacks, but that focus primarily on domestic terrorism.

[4]"Geocoding" refers to coding the latitude and longitude coordinates of attack locations.

coverage, distance to international borders, level of civil conflict, distance to capital cities, local economic activity, and population density. A central goal of the study is to demonstrate that local-level factors play an important role in explaining transnational terrorism. We expect that country- and region-level factors should matter nonetheless, as the case of Kenya illustrates well. Therefore, to supplement basic analyses, we estimate comprehensive multi-level models that allow us to draw stronger conclusions about the role of local level determinants alongside more traditional explanatory and control factors.

The PRIO-GRID incorporates in excess of 64,000 cell locations globally. In addition, our analyses include data covering a forty-one year period (1968–2008). Given that there are a total of approximately 13,000 transnational terrorist events, the local observation of terrorism turns out to be a rare event. Accordingly, we employ two techniques designed to take account of this rarity. First, we dichotomize the outcome variable – differentiating between grid location-years in which there is no terrorism and those in which there is at least one terrorist attack. We then employ rare events logit (ReLogit) to assess patterns in this form. Second, we incorporate propensity score matching to identify grid locations in time that are "identical" in all possible ways except that some experience civil conflict and others do not. We then estimate the effects of the "treatment" of civil conflict on the likelihood of experiencing terrorism within a reduced set of highly similar observations.

Across each of our models, the analyses confirm that attacks are most likely at locations: with recent civil violence, proximate to the capital city and international borders, with low levels of forest cover but mountainous terrain, and in urban areas with higher populations and levels of economic activity. Of the country-level variables, state repression is positively associated with terrorism, capabilities and capacity are negatively associated with terrorism, but democracy is only negatively associated with terrorism in two of the three specifications. Furthermore, the influence of state capacity as a deterrent decays as distance from the capital increases. The country-level results for military capability are opposite of what the literature would expect and the largely null results for democracy run contrary to much of

the arguments and findings in the literature on transnational terrorism. On the other hand, nearly all of the local-level results are as expected.

Thus, the story that emerges is that local factors matter considerably in determining where transnational terrorist attacks occur. The study contributes to the terrorism literature by providing the first examination of local-level determinants of transnational terrorism and showing why scholarship in this area that accounts only for country- and region-level factors provide incomplete explanations. Within the local context, we show that vulnerability and value characteristics matter, and the results indicate that these two dimensions need to be explored in greater depth in future research with explicit attention focused to theorizing and testing refined local-level models.

Causes of Transnational Terrorism

Transnational terrorism has been the focus of substantial scholarly research for several decades (Enders and Sandler 2006), and the research agenda has only intensified in recent years with an emphasis on quantifying the correlates of this form of terrorism.[5] Nearly all of this research identifies possible country- or region-level causes and consequences.[6] Among them, Krueger and Laitin (2012) find that transnational terrorists tend to target economically successful countries, while foreign direct investment and trade may decrease transnational terror within recipient countries (Li and Schaub 2004). In their review of the literature on the determinants of terrorist attacks, Krieger and Meierrieks (2011) also conclude that economically richer countries, along with those that are politically open but unstable and with large populations, are more frequently targeted. Others suggest that countries targeted

[5]Sandler (2014) offers a recent survey of some of the accomplishments of the analytical approach to understanding these causes and consequences.

[6]Scholars quantifying the causes of *domestic* terrorism have also focused primarily on country-level determinants, though our focus in this paper is on transnational forms of terror.

by transnational terrorism are characterized by low economic openness, demographic stress, and international disputes (Drakos and Gofas 2006). Democracies tend to experience less transnational terrorism, and democracies with proportional representation systems experience less than those with majoritarian and mixed systems (Li 2005). Studies in this vein have refined our understanding of the cross-national determinants of transnational terrorism; but they have also neglected local determinants.

Despite the country- and region-level foci, existing studies only occasionally discuss geography. Midlarsky, Crenshaw, and Yoshida (1980) investigate the diffusion and contagion of terrorist tactics and events. They argue that the global temporal and spatial distribution of terrorist incidents can follow four possible patterns: (1) "randomness," by which terrorist events may be distributed randomly in space and time; (2) "heterogeneity," by which the propensities of different countries to experience terrorism are disparate across space but constant over time; (3) "contagion," by which the occurrence of a terrorist incident in one country increases the probability of a neighboring country experiencing an incident in a subsequent period; and (4) "reinforcement," by which the occurrence of a terrorist incident in one country increases the probability that the same country will experience terrorism in a subsequent period. Examining the data in their sample, the authors conclude that the most striking pattern observed is one of contagion from Latin America to Europe. In a response article, Heyman and Mickolus (1980) argue that this pattern actually results from a process of mimicry, with Latin American terrorist groups leading the way and being copied by groups emerging at a later stage in Europe.

In a similar consideration of possible diffusion effects, Enders and Sandler (2006) study the distribution of transnational terrorism by examining whether there was a post-9/11 transfer of terrorist attacks to low-income countries. Contrary to conventional wisdom, efforts by wealthy countries to counter terrorism do not appear to have resulted in the transference of these acts to poorer states, presumably less capable of launching effective counterterrorism efforts. But the research does show that there was a significant transference of terrorist

incidents from North America and West Europe to the Middle East and Asia following the adoption of dramatic new counter-terrorism measures in the United States and the United Kingdom. Adopting an explicit geographic information systems approach to the analysis of regional clustering of events, Braithwaite and Li (2007) identify *country-level* hot spots of transnational terrorist attacks and demonstrate that the hotspots play a crucial role in subsequent patterns of diffusion in space and time.

These studies have offered insights into the diffusion and contagion of terrorist activities and have contributed to the successful identification of regional patterns of heterogeneity and dependence in the distribution of terrorist incidents. This evidence suggests that it is possible to identify and forecast country- and region-level terrorism hot spots. However, analysis that aggregates data at the country or region-level misses much of the important geographic variation in terrorist attacks. In response, our study is motivated by an expectation that the locations of terrorism hot spots do not coincide perfectly with conventional boundaries of regional and country units. In this respect, we follow the suggestion of John Agnew (1994) to "escape the territorial trap" that is the national boundary. As not all states share an equal likelihood of hosting attacks, this insight suggests that not all sub-state spatial units within any given state are equally likely to host those attacks that target the state. And sub-state variation could provide greater insights into the distribution of transnational terrorist events than even country- or region-level variation.

There is a precedent for the use of more fine-grained location data in the study of a range of related topics. In the study of civil war, a literature has developed that addresses how local geography affects the likelihood of civil war onset (Buhaug and Rød 2006, Raleigh and Hegre 2009, Buhaug, Gleditsch, Holtermann, Østby, and Tollefsen 2011), duration (Buhaug and Lujala 2005), and rebel capability (Buhaug, Gates, and Lujala 2009). Studies of social conflict using georeferenced conflict data, for example, have shown that cell phone coverage (Pierskalla and Hollenbach 2013) and environmental factors such as rainfall levels (Hendrix and Salehyan 2012) and weather conditions (Carter and Veale 2013) each increase the propen-

sity of conflict at the local level.

Despite the progress made in understanding the effects of local geography on civil war generally, the geographic dimensions of terrorism remain, overall, a remarkably understudied topic of research (Bahgat and Medina 2013). Bapat (2007) argued that terrorist groups tend to locate themselves in countries that are stronger than their intended target countries. He suggests that this is likely the case, because they are attempting to minimize the prospects for retaliation by the targeted country. Building upon this work, Gaibulloev (2015) examines the factors that influence groups' decisions regarding where to base their operations. He analyzes 525 terrorist groups and 113 potential base locations. Employing a conditional logit design, in which groups select between all plausible base locations, he demonstrates that groups are most likely to select base countries with higher numbers of pre-existing groups, most especially those countries with pre-existing groups that share their ideology. Furthermore, it is apparent that groups base themselves in fragile countries and that are relatively proximate to the venues of their planned attacks. With respect to the analysis of the locations of the attacks themselves, the majority of extant published studies have been limited in geographic scope to analyses of attacks in particularly countries, for example, Israel (Kliot and Charney 2006, Berrebi and Lakdawalla 2007), Spain (LaFree, Dugan, Xie, and Singh 2009), the United States (Cothren, Smith, Roberts, and Damphousse 2008, Webb and Cutter 2009), and Iraq (Townsley, Johnson, and Ratcliffe 2008, Johnson and Braithwaite 2009, Braithwaite and Johnson 2012).[7]

Research using "changepoint" regression models has shown that transnational terrorist attacks are increasingly aimed at *soft* or un-hardened locations within target countries, such as private actors, rather than property or public infrastructure (Brandt and Sandler 2010, Santifort, Sandler, and Brandt 2013).[8] Much less is known, however, about the process of

[7]Point locations have also been analyzed at the global-level in order to uncover hot spots of militarized disputes (Braithwaite 2006, Braithwaite 2010) and civil conflicts (Buhaug and Gates 2002).

[8]Enders and Sandler (1993) initiated research into substitution effects—the notion that

geographic target selection— and, specifically, about the factors that determine *where* within the borders of independent states transnational terrorist attacks are likely to occur. To our knowledge, Findley and Young (2012) and Nemeth, Mauslein, and Stapley (2014) are the only other global, subnational geocoded studies, both of which focus primarily on domestic terrorism, are limited in temporal scope, and do not consider local and country-level factors simultaneously. The transnational terrorism literature suffers from a dearth of fine-grained data on the location of terrorist activities on a broadly cross-national basis. This is precisely the lacuna we hope to address in this paper by considering the dimensions of local value and vulnerability and placing those factors in the broader discussion on transnational terrorism.

Determinants of Terrorism

We begin by employing a fairly well accepted definition: "[t]errorism is the premeditated use or threat to use violence by individuals or subnational groups in order to obtain a political or social objective through intimidation of a large audience beyond that of the immediate victims" (Enders and Sandler 2006, 3).[9] We are especially interested in transnational events—those in which at least two of the nationalities of the perpetrators, victims, or host state differ. Non-state actors often consider terrorism a last resort, because they are typically actors that are located on the 'wrong' side of a considerable power asymmetry in their relations with the government that they are challenging. The primary means by which terrorists will look to compensate for this asymmetry is by using violence in a manner that maximizes the media coverage and public discussion of their attacks.

We contend that the desire to maximize media coverage and publicity encourages non-

certain targets will become more attractive to terrorist targeting when others are hardened or become more costly to targeting by the group.

[9]For purposes of this paper, debating definitions would not advance the discussion productively. We follow Young and Findley (2011) who contend that the distinctions may not always matter for specific applications.

state actors to attack vulnerable and valuable targets. A target is vulnerable if it is relatively easy to access and attack. A target is valuable if its being targeted is likely to attract greater media (and, therefore, public) attention. At some level, these attributes overlap conceptually with what Most and Starr (1989) refer to as *opportunity* and *willingness* and Diehl (1991) refers to as *geography as context* and *geography as cause*.[10] In practice, differentiating value from vulnerability is difficult for any given location. We thus consider value and vulnerability as broad, non-mutually exclusive organizing concepts that may help identify where transnational terror attacks are likely to occur.

Subnational Value and Vulnerability

The value of a location refers to the extent to which a particular location is home to assets of value to either the terrorists, the targets, or the audience. On the one hand, this means that such a target is likely to attract greater levels of public attention when attacked. This is crucial, because, as noted above, we assume that terrorists are looking to overcome a considerable resource disadvantage *vis-a-vis* the government that they challenge. One key way of doing that is to mobilize support by getting the group's message out to as wide a population as possible, which is also likely to provoke a fearful response within the widest possible audience. Value targeting might, for instance, see terrorists looking to damage symbolic assets. This could include assets that represent the tyranny against which they perceive they are struggling. This could also include assets that are likely to be held dear to the heart of citizens. Based upon this reasoning, generally we expect:

[H_1]: *The greater (or lower) the value of a specific location, the higher (lower) the likelihood of a terrorist attack occurring in that location.*

The vulnerability of a location refers to the extent to which a particular location makes

[10]The vulnerability/value distinction is also similar to what Berrebi and Lakdawalla (2007, 4-5) call *preferences* and *productivity*.

(im)possible the task of executing a terrorist attack. This is important given the aforementioned resource disadvantage that the terrorist faces. Given scarce resources, the terrorist must ask whether it is possible to deploy force to a particular location and whether it is possible to carry out a terrorist attack once at that location. In other words, vulnerability refers to the extent to which various "barriers" to attack are present or absent at a particular location. We thus generally expect:

[H_2]: *The greater (or lower) the vulnerability of a specific location, the higher (or lower) the likelihood of a terrorist attack occurring in that location.*

Conceptually, we argue that the value and vulnerability of a target are most credibly thought of as the product of at least five components. The first concerns the *security* of the target.[11] Factors such as the presence of military and police personnel, barriers to entry, and technology that detects the movement of individuals near the perimeter of the target (surveillance equipment, etc.) all serve to increase the security of the target.[12] However, ongoing civil conflict in a country may reduce and degrade the security infrastructure of a country, allowing for attacks on targets that may otherwise be less vulnerable. We thus expect that:

[H_3]: *Ongoing civil conflict in an area increases the likelihood of a terrorist attack occurring relative to areas without civil conflict.*

Secondly, the *accessibility* of the location influences the value and vulnerability of a target. Targets that are located in isolated, difficult-to-reach areas are less accessible, and thus less

[11]Building on Enders and Sandler (1993), Nemeth, Mauslein, and Stapley (2014) are mainly concerned with this dimension of attracting domestic attacks.

[12]Increasing the security of public infrastructure has inadvertently shifted the focus of terrorist attacks towards private individuals, who are less easily secured from these attacks (Santifort, Sandler, and Brandt 2013, Mathews and Lowenberg 2012, Brandt and Sandler 2010).

vulnerable, than targets in populated ones. Thus, we expect populated areas to experience more transnational terror events than less populated ones.[13] We thus expect that:

[H_4]: *The shorter the distance to an international border, the higher the likelihood of a terrorist attack.*

Third, the level of *preparation* terrorist groups can achieve prior to launching an attack against a target shapes its vulnerability. Terrorists often seek access to safe havens, whether in neighboring countries or hidden in areas with harsh terrain (such as mountainous or forest-covered regions), at which to prepare and plot attacks (Korteweg 2008, Kittner 2007). This leads to two expectations:

[H_5]: *Mountainous terrain in an area increases the likelihood of a terrorist attack occurring relative to areas without mountainous terrain.*

[H_6]: *Forest coverage in an area increases the likelihood of a terrorist attack occurring relative to areas without forest coverage.*

Fourth, the *symbolism* of a target, whether cultural, political, or social, can enhance how valuable a target is. Attacking a symbolic target, such as those located in or near the national capital, enhances the significance of the attack beyond its immediate, direct effects.

[H_7]: *The closer a location is to the capital, the higher the likelihood of a terrorist attack occurring in that location.*

Finally, the *material harm* that can result from attacking a target increases its value for terror groups. For example, one terrorist manual called for "blasting and destroying the embassies and attacking the vital economic centers" as well as destroying the "bridges leading

[13] Urban areas are frequently the main targets of terror attacks, both in the developed world (Glaeser and Shapiro 2001, Savitch and Ardashev 2001) and the developing world (Beall 2006).

into and out of cities" (Anonymous 2003, 12). Thus, we expect that more economically productive and highly populated areas should be more valuable as targets for terrorist attacks, leading to the following hypotheses:

[H_8]: *Higher levels of local population in an area increase the likelihood of a terrorist attack relative to areas with lower levels of local population.*

[H_9]: *The higher the economic productivity of a location, the higher the likelihood of a terrorist attack.*

[H_{10}]: *The closer a location is to an urban area, the higher the likelihood of a terrorist attack.*

We offer the concepts of value and vulnerability as an organizing device for a variety of expectations regarding which locations are likely to be targeted by transnational terrorist attacks. We do not, therefore, treat these concepts as rigid, distinct categories. One reason is that some of the factors that make a location valuable may also make it more vulnerable, and vice versa. For instance, populated areas are more vulnerable because there are more potential victims than unpopulated areas. Yet they are also more valuable, as launching indiscriminate attacks in these areas may contribute to a climate of fear in a country and may induce a general feeling that "anyone could be next."[14] Despite some overlap, the value and vulnerability concepts, along with the observable implications of these concepts that we have outlined, are useful for helping to understand target selection of transnational terror events at the sub-national level.

[14]Kliot and Charney (2006, 354-355), citing Cutter, Richardson, and Wilbanks (2003, 2), argue that "[i]t is important to stress that terrorism is successful in inducing fear because it exposes civilians to attacks which have a random quality, so that everyone feels less safe....The seeming randomness of terrorist attacks increases public anxiety concerning terrorism." See also Braithwaite (2013).

Country-level Determinants

Our hope is to draw greater attention to local determinants of transnational terrorism behavior by considering the value and vulnerability of specific locations. And yet we do not contend that country-level factors are irrelevant. Indeed, we argue that a satisfactory explanation for transnational terrorism needs to account for both local and country-level factors. At the country level, we expect that state repression should increase terrorism, power asymmetries should increase terrorism, greater state capacity should decrease terrorism, ethnic fractionalization should increase the incidence of terrorism, and democracy should be associated with less terrorism. None of these arguments is novel; at least some evidence for each of these expectations can be found in the larger literature as discussed in the literature review. Our hope is that an examination of these factors in conjunction with the subnational factors mentioned above provides the best means of complementing a local explanation to produce a more comprehensive explanation of the correlates of transnational terrorism.

Modeling the Geography of Terrorist Attack Locations

The PRIO-GRID dataset (Tollefsen, Strand, and Buhaug 2010) used herein partitions global territories into 64,804 equally sized (0.5 x 0.5 degrees) grid cells. We use observations from PRIO-GRID for 1968–2008, which means that the primary unit of analysis is the cell-year. To consider both local and country-level factors together, we complement the standard time-series cross-section models with multi-level models that bring together cell-year and country-year information into the same analysis.

The data structure is comprised of a large number of observations and in this data structure terrorist event counts are rare events. To address the rarity of events, we employ several estimation strategies. First, we collapse terrorist attack counts into a binary variable indicating that an attack either happened or did not. Using the dichotomized variable, we employ the Re-logit estimator (King and Zeng 2001*a*, King and Zeng 2001*b*) using the

full sample. Second, to preserve information about the count of attacks, we use a negative binomial model on the full sample. Finally, we use propensity score matching to reduce the number of observations. In the matching models, we match on civil violence and compare a reduced set of observations that are otherwise similar on all other observable dimensions. With the matched sample, we conduct rare events legit and negative binomial models.

Measuring Terrorist Attack Location

To examine subnational variation, we geographically coded (latitude and longitude) of all events in the ITERATE dataset. Each of the approximately 13,000 transnational terrorist events from the ITERATE database have thus been assigned a pair of latitude and longitude coordinates and then joined (using ArcGIS v10.0) with their corresponding grid cell location from the PRIO-GRID dataset. As a result of the merge, we have both a count and a binary indicator of terrorist attack locations. In the first instance, we have a simple count (0 or positive integer) of the total number of attacks within each cell in each year. In the second instance, the binary variable is assigned a value of "1" if at least one terrorist attack occurs within the cell in a given year and "0" otherwise.

Geocoding the Terrorism Events

The ITERATE project provides detailed data on the characteristics of transnational terrorist groups, their activities that have international impact, and the environment in which they operate (Mickolus et al. 2003). We have geocoded all events from 1968 to 2014, but for analysis purposes we are constrained by the data in PRIO-GRID (as discussed below) such that the empirical analysis reported in the paper covers 1968–2008.[15]

[15] All geocoded data through 2014 will be available with replication materials.

Geo-Coding Methodology

This project uses a modified version of the UCDP/AidData geo-coding methodology originally based on Sundberg, Lindgren, and Padskocimaite (2010) to assign sub-national geographic information, where possible, to ITERATE terrorism event entries based on information provided in event descriptions. Among the information coded, we include latitude and longitude coordinates, location name and ID, administrative boundary information, and a precision code.

Sources vary with respect to the precision of information about locations of attacks that are reported in ITERATE. Sometimes the exact location is named and in other instances the general area is reported; therefore, we use the system of geo-referencing used by UCDP/AidData, which identifies coordinates for information at four main levels, ranging from point locations, through two administrative divisions, to the country level. Seven precision categories are connected to the coordinates in order for researchers to select subsets of the dataset that contain different levels of precision. If the event description only gives information on the administrative division, and not the exact location, then the centroid point of the administrative division is entered into the latitude and longitude columns. If there is no direct mention of any location in the event description, the country coordinates are coded with precision "7", which indicates that the location is unknown.

In order to obtain the latitude and longitude coordinates of geographic locations mentioned in the documentation, a geographic gazetteer is necessary. This project has relied primarily upon `www.geonames.org`, which provides not only the latitude and longitude of a location, but also the administrative division under which it is governed (province, district, central government, etc.) and a geographic identifier that is unique to each location. More details about precision codes appear in the supplementary information document. The majority of terrorist event observations are coded at the precision code 1 level (77.1 percent) and nearly 90 percent of the events can be geocoded at precision codes 1–5. Thus, the majority of the observations of terror attacks in the dataset are coded with a relatively high degree

of precision as to where the attack occurred. We include all observations except the 7s (for which information is unavailable) in the statistical models that follow. Figure 1 displays the global distribution of terrorism events based on our coding of the ITERATE data, and the supplementary information contains maps of selected individual countries to provide a closer look.

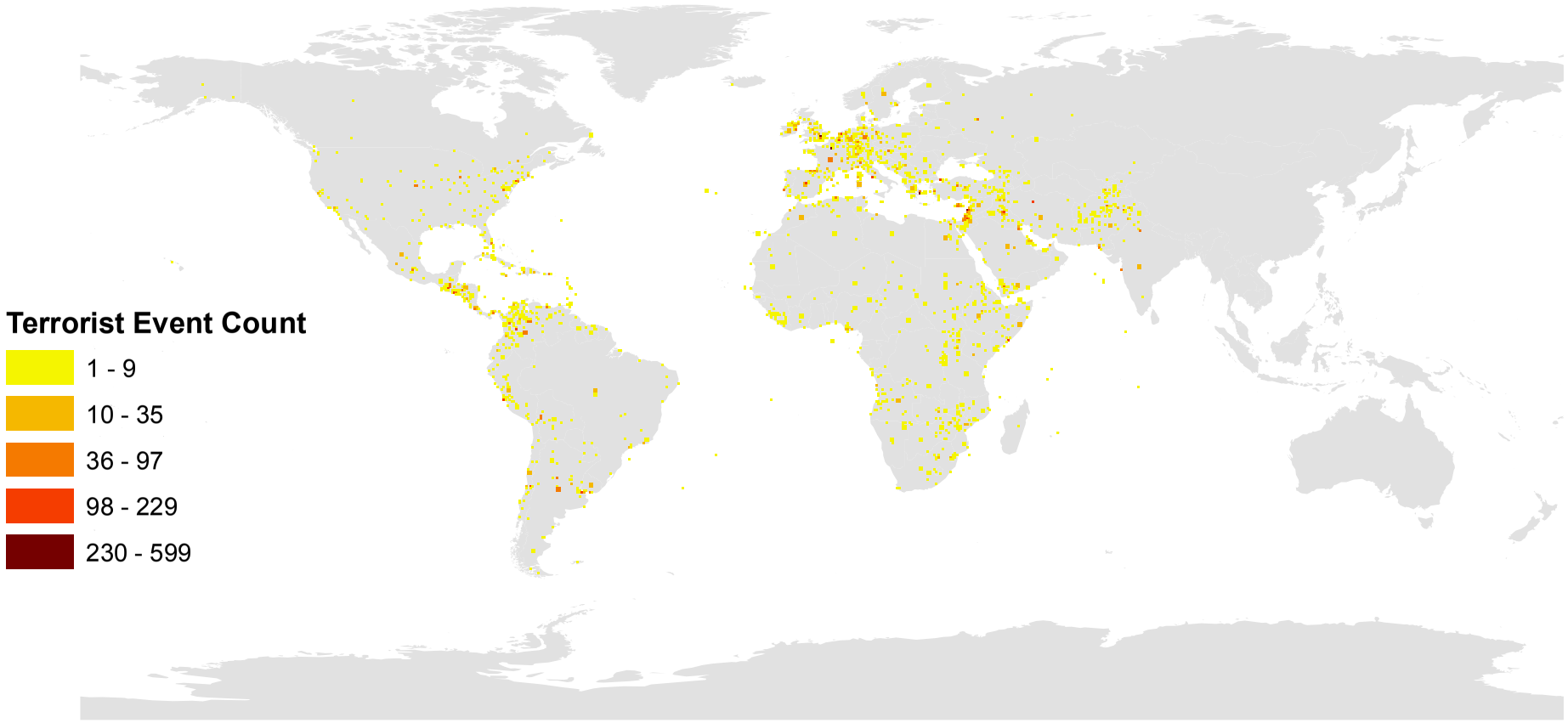

Figure 1: Global Locations of Transnational Terrorism

Measuring Value and Vulnerability

All of the location-level data used to operationalize our key *vulnerability* and *value* explanatory variables are drawn from the PRIO-GRID dataset (Tollefsen, Strand, and Buhaug 2010). We detail their operationalization and list, where appropriate, details of the original source data.

Civil Conflict: This covariate is a dummy variable representing the presence or absence of an ongoing intrastate or internationalized intrastate conflict within the cell. These data reflect the conflicts in the UCDP conflict dataset (Harbom and Wallensteen 2010) and are based on the updated version 3 of the conflict site coding (Dittrich Hallberg 2012) for the time period 1989-2008 and version 2 of the conflict site coding (Raleigh, Cunningham, Wilhelmsen, and Gleditsch 2006) originally developed by Buhaug and Gates (2002) for the time period 1968-1988.

Distance to International Border: These data provide the distance from the center of the cell to the border of the nearest contiguous country and is scaled in hundreds of kilometers (Tollefsen, Strand, and Buhaug 2010).

Terrain: Drawn from the United Nations Environmental Programme's Mountain Watch Report (UNEP 2002), these data provide the proportion of each cell that is mountainous.

Distance to State Capital: These data provide the distance from the cell to the national capital in the corresponding country using the cShapes dataset and is scaled in hundreds of kilometers (Weidmann, Kuse, and Gleditsch 2008).

Forest Cover: Drawn from the Globcover 2009 dataset (Arino 2010), these data provide estimates of the percentage of forest cover in each cell.

Population: These data, taken from the Gridded Population of the World (Center for International Earth Science Information Network (CIESIN)/Columbia University, (FAO), and de Agricultura Tropical (CIAT) 2005), provide population size for 1990, 1995, 2000, and 2005. The missing years were filled by log-scale interpolation for years between 1990

and 2005 without data and log-scale extrapolation for years prior to 1990 and after 2005. Population is divided by 1000 to facilitate interpretation.

Economic Productivity: These data represent the per capita gross cell product (GCP) in 1990 USD in each cell, drawn from the G-Econ dataset (Nordhaus 2006). To facilitate interpretation, GCP is divided by 1000 U.S. dollars.

Urban: This variable, drawn from Nelson (2008), shows the estimated travel time in 100 minute units to a city with a population of greater than 50,000 within the cell. We multiply the distance by negative one so that the variable reflects proximity to an urban area.

Control Variables

Total Land Area in Grid Cell: This covariate represents the area of land within the grid cell (Tollefsen, Strand, and Buhaug 2010) scaled as 100 square kilometer units.

Precipitation: These data provide yearly total precipitation in each cell scaled in meters, based on meteorological data gathered by the University of Delaware (National Oceanic and Atmospheric Association 2011).

Ethnic Fractionalization: Using the GeoEPR dataset (Wucherpfennig, Weidmann, Giardin, Cederman, and Wimmer 2011) through PRIO-GRID we created a Herfindahl-Hirschman index of the amount of area each group controlled in a cell. The variable *Ethnic Fractionalization* is 1 minus this index and reflects the amount of ethnic diversity in territorial control.

Infant Mortality Rate: These data based on the SEDAC Global Poverty Mapping project (Storeygard, Balk, Levy, and Deane 2008) represent the number of children per 1,000,000 that die before reaching their first birthday. These data were only available for the year 2000, and so data for that year were entered for all remaining years.

Country Level Variables

Regime Type: We used a diversity of measures of regime type including the Vanhanen Index of Democratization (Vanhanen and Lundell 2014), Freedom House Imputed Polity

Index (Hedenius and Teorell 2005), and the Revised Combined Polity Score (Marshall and Jaggers 2013).

Capability and Capacity: To measure state capability and capacity we used CINC score from The Correlates of War Project (Singer, Bremer, and Stuckey 1972) as well as the two factor measure of military capacity and bureaucratic capacity developed by Hendrix and Young (2014). To provide a better spatial measure of capacity, we interact these measures of state capacity with distance to state capital.

Political Terror: This is the Political Terror Scale published by Amnesty International, which provides a measure of state-sanctioned killings, torture, disappearances, political imprisonment at the country level (Gibney, Cornett, Wood, and Haschke 2013).

Results: Location, Location, Location

As a first step, we estimate a rare events logistic regression using a binary dependent variable of whether a transnational terror attack occurred or not. The results appear in the left column of Table 1. Overall, the results provide support for nearly all of the hypotheses outlined above. Civil conflict and mountainous terrain both have a positive and significant effect on the likelihood of a terror attack. The effect of distance to an international border is negative and significant, meaning that border areas are more likely to be targeted. The effect of distance to capital is negative and statistically significant, suggesting that terrorists often target capital cities. The coefficients on economic activity and proximity to urban areas are positive and significant. The only exception is the results testing the expectation that forested areas should be more likely to experience terrorist attacks due to vulnerability. In fact, we find the opposite, that terrorist attacks are less likely to occur in forested areas. This may be due to the finding, discussed below, that terror attacks are more associated with urban areas, and urban areas typically have lower levels of forest cover due to deforestation.

Next, we estimated a negative binomial regression on the count of terror events in each

	Rare Events Logit	Negative Binomial
Civil Conflict in Cell	1.477***	1.661***
	(0.108)	(0.150)
Distance to International Border	-0.123***	-0.0963**
	(0.0242)	(0.0301)
Mountainous Terrain	0.657***	0.906***
	(0.139)	(0.195)
Distance to Capital	-0.153***	-0.136***
	(0.0233)	(0.0288)
Forest Coverage	-0.00794**	-0.0170***
	(0.00255)	(0.00362)
Population	0.00000201***	3.25e-08
	(1.56e-08)	(1.79e-08)
Economic Activity	0.695***	0.982***
	(0.0752)	(0.0961)
Urban	0.490***	0.306**
	(0.113)	(0.115)
Land Area	0.0212	0.0127
	(0.0196)	(0.0199)
Precipitation	0.531***	0.920***
	(0.0646)	(0.150)
Ethnic Fractionalization	0.151	0.0416
	(0.189)	(0.269)
Infant Mortality Rate	0.0504*	0.0661*
	(0.0206)	(0.0282)
Constant	-10.76***	-13.22***
	(0.880)	(1.088)
$\ln(\alpha)$		4.563***
		(0.145)
Observations	1617804	1617804

Clustered Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: Rare Events Logit and Negative Binomial Models

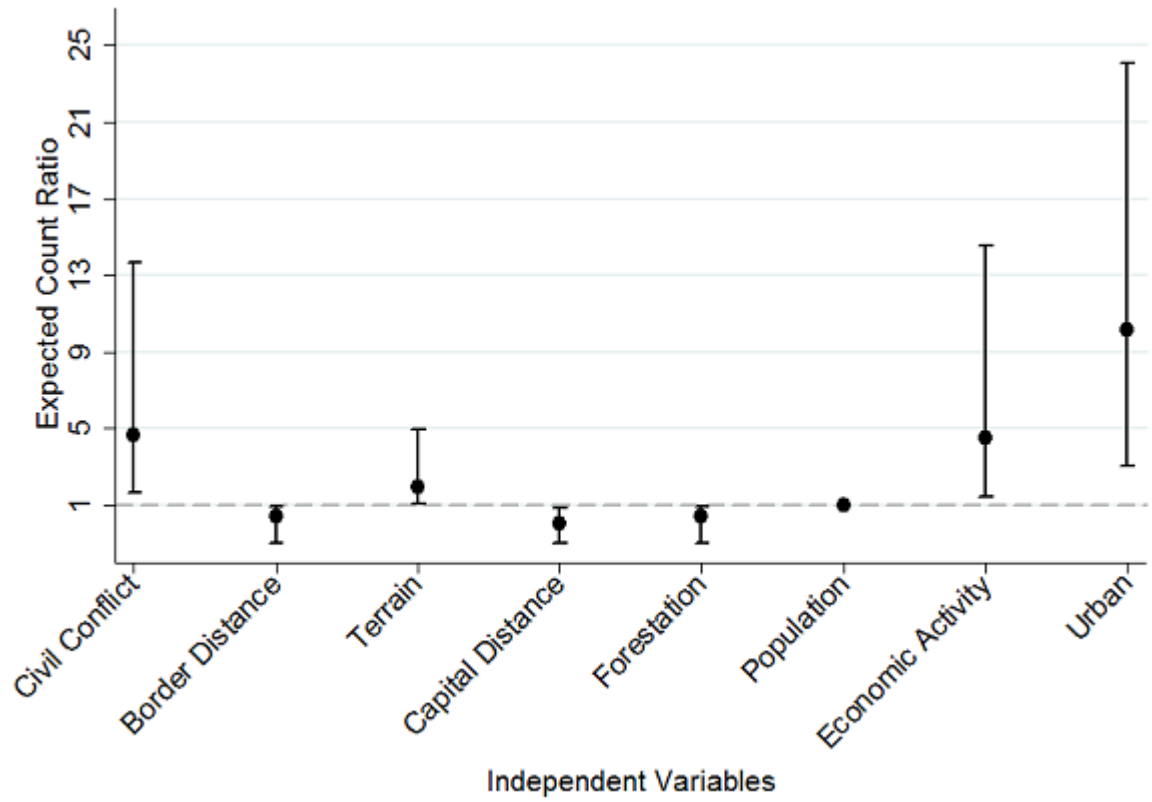

Figure 2: Expected Count at 90th Percentile Relative to Expected Count at Mean

cell-year. The results are presented in the right column of Table 1. The results are similar to the rare events logit model, except the coefficient on local population was not significant in the negative binomial model. In order to provide some interpretation of the substantive size of these coefficients, Figure 2 presents the ratio of the expected count at the 90th percentile of each variable to the baseline expected count at the mean of the variable, holding all other variables at their mean. The bars represent the 95 percent confidence intervals. As Figure 2 shows, the expected count increases by five times when there is civil conflict in a cell. Mountainous terrain more than doubles the expected count of transnational terror attacks. Movement from the mean to the 90th percentile of capital distance from the mean halves the expected count of terrorist attacks. An increase in economic activity increases the excepted count by four times. The substantive effect of urban is greatest, with the expected count of terror attacks increasing by an order of magnitude.

Multilevel Models

To compare the local and country level factors together, we examine whether modeling this multilevel structure influences the inferences of the original models. The results for the multilevel random effect negative binomial models are presented in Table 2. Each column includes a different measure of regime type. The left column includes the Vanhanen Index of Democratization. The middle column includes the Freedom House Imputed Polity Index. The right column includes the Revised Combined Polity Score.

In each of the multilevel models, civil conflict has a positive and significant effect. Distance to border is negative and significant in each. Mountainous terrain is significant and positive for each multilevel model. Like the above models, forest coverage has a negative and significant association in each of the multilevel models. The coefficients on cell population, economic activity and urban are significant and positive for all of the multilevel models. The effect of distance to capital is negative and significant in each of the multilevel models. In sum, nearly all of the results are robust to this modeling choice and demonstrate a set of local covariates that are important for explaining transnational terrorism.

Turning to the country level variables, the coefficient on Political Terror Scale is positive and significant for all of the multilevel models, which is expected. The coefficients on military capacity and bureaucratic capacity are also negative and significant for each model in Table 2. These results suggest that state capacity has a negative effect on transnational terrorism, which is expected, but that increases in state capabilities reduce terrorism, a result that runs contrary to conventional wisdom in the larger literature on transnational terrorism. It may be the case that military capability serves as a deterrent for terrorism rather than an opportunity structure in which terrorism is the primary available means. To understand how these effects decay, we interact capacity and capability with distance to capital. The interaction is not significant for bureaucratic capacity but is significant and positive for the interaction of military capacity and distance to capital in the model which includes the Vanahanen Index of Democracy as its measure of regime type, suggesting that a deterrent effect of military

	Event Count	Event Count	Event Count
Cell Level			
Civil Conflict in Cell	1.013***	1.004***	0.991***
	(0.106)	(0.106)	(0.106)
Distance to International Border	-0.0736***	-0.0723***	-0.0725***
	(0.0181)	(0.0181)	(0.0181)
Mountainous Terrain	0.274**	0.273**	0.276**
	(0.104)	(0.104)	(0.104)
Distance to Capital	-0.0848***	-0.0836***	-0.0828***
	(0.0174)	(0.0173)	(0.0173)
Forest Coverage	-0.0114***	-0.0113***	-0.0114***
	(0.00160)	(0.00160)	(0.00160)
Population	1.497***	1.499***	1.500***
	(0.0540)	(0.0540)	(0.0540)
Economic Activity	1.019***	1.012***	1.005***
	(0.0773)	(0.0773)	(0.0770)
Urban	0.123***	0.123***	0.123***
	(0.0159)	(0.0159)	(0.0159)
Land Area	-0.0281**	-0.0279**	-0.0279**
	(0.0103)	(0.0103)	(0.0103)
Precipitation	0.486***	0.485***	0.488***
	(0.0668)	(0.0668)	(0.0668)
Ethnic Fractionalization	0.863***	0.863***	0.866***
	(0.175)	(0.175)	(0.175)
Infant Mortality Rate	0.0127	0.0127	0.0144
	(0.0282)	(0.0282)	(0.0281)
State Level			
Political Terror Scale Amnesty International	0.236***	0.232***	0.233***
	(0.0490)	(0.0492)	(0.0489)
Bureaucratic Capacity	-0.422***	-0.447***	-0.439***
	(0.0998)	(0.0982)	(0.0982)
Bureaucratic Capacity X Distance to Capital	-0.0156	-0.0146	-0.0139
	(0.0112)	(0.0112)	(0.0112)
Military Capacity	-1.212***	-1.260***	-1.234***
	(0.127)	(0.126)	(0.126)
Military Capacity X Distance to Capital	0.0202*	0.0194	0.0187
	(0.0101)	(0.0101)	(0.0101)
Index of Democratization	-0.0138*		
	(0.00637)		
Freedom House/Imputed Polity		-0.0414	
		(0.0235)	
Combined Polity Score			-0.00574*
			(0.00242)
Constant	-13.95***	-13.85***	-14.04***
	(0.787)	(0.797)	(0.784)
$\ln(\alpha)$	2.984***	2.982***	2.985***
	(0.0529)	(0.0528)	(0.0528)
σ^2(State)	2.471***	2.501***	2.423***
	(0.487)	(0.496)	(0.479)
Observations	745412	745416	745416

Standard errors in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Multilevel Negative Binomial Models

capability may deteriorate as distance from capital increases. The coefficient on the Freedom House Imputed Polity Index measure of regime type is not statistically significant. However, the Revised Combined Polity Score and the Vanahanen Index of Democratization measures both have negative and statistically significant coefficients, providing some albeit limited support for standard country level explanations.

Interestingly, while the effect of ethnic fractionalization is not significant in any of the subnational-only models the effect of ethnic fractionalization is positive and significant in all of the models which take into account the hierarchical nature of the data. The random effect for country is significant across each of the multilevel models.

Reduced Sample and Individual Country Cases

We narrowed the sample in three ways. First, we used propensity score matching to reduce the sample and create more balanced comparisons. In particular, we matched the sample on the civil conflict variable, meaning that the observations should in expectation be highly similar in all ways except some experienced civil conflict and others did not. Appendix Table 1 presents the results for matched data using a rare events logit model and a negative binomial model. The effect of civil conflict is positive and significant in both the rare events logit and negative binomial model. We also estimated the multilevel models on the sample matched on propensity for civil conflict. Appendix Table 2 presents the results of this analysis. The results are substantively similar to those in Manuscript Table 2. In support of the third hypothesis, the effect of civil conflict in a cell is positive and significant for each of the matched multilevel models.

Second, we also reduced the sample by eliminating the time dimension from the models. We thus consider a cell level analysis, which helps with the issue of zero inflation because it lessens the number of observations by 41 times. To do this, we take the average of the time-varying variables economic activity, population, and cell ethnic fractionalization described in the text of the paper. We include civil conflict as a dummy for whether civil conflict occurred

in the grid cell between 1968 and 2008. Similarly, the dependent variable for the rare events Logit model is a dummy for whether terror attacks ever occurred in the cell between 1968 and 2008. The dependent variable for the count models is the total number of terror events that occurred between 1968 and 2008. Note that for the reduced sample we were also able to conduct a zero-inflated negative binomial analysis, which would not converge with the full sample. The results of the cell level analysis support the results from the cell year models above. The coefficient on civil conflict is positive and significant. The coefficient on distance to an international border is negative and significant as expected. Mountainous terrain is significantly associated with an increase in terror attacks. Attacks are significantly more likely near a capital city. Like in the cell-year models, the coefficient on forest coverage is negative and significant contradicting the expectation of Hypothesis 6. The coefficient on population, economic activity and urbanness are each positive and significant as expected. The results of the zero inflated negative binomial model at the cell level are presented in Appendix Table 4 and are substantively similar to the results in Appendix Table 3.

Third, and finally, we also considered a set of individual cases that we report on in the supplementary information. We created a series of country maps and single country statistical models for each of five countries: Peru, Argentina, Colombia, India, and Turkey. These cases are meant to illustrate the cross national results rather than test any hypotheses. We used a several criteria to select cases to investigate. First, if the country experienced civil violence between 1968 and 2008, so that we could estimate a coefficient for civil conflict. Second, we considered countries which had a large number of grid cells and the ability to evaluate patterns of transnational terrorism statistically in single country models. See Appendix Table 5 for a summary applied to these five cases. These cases can be considered exploratory probes into the geographic dynamics of transnational terrorism in single countries. In the supplementary information, we briefly discuss each case in turn to show that regardless of the variation among these variables, similar geographic patterns of terrorism emerge. We also identify some disagreement between the cases and the cross national models

and suggest some possible explanations and areas for future research. Overall, however, the results largely support those in the cross-national analyses. These results are reported in Appendix Figures 1–5 and Appendix Tables 6–16.

Conclusion

This paper explored the implications of the variability in subnational locations on the likelihood of terrorist attacks occurring locally, explicitly modeling local and country-level factors together. From a global perspective, it is clear that not all locations are equally likely to host a transnational terrorist attack. We offered an organizing framework emphasizing *vulnerability* and *value* factors that allows locations to be differentiated. And we introduced new, sub-nationally geographically coded data on transnational terrorism and demonstrated that local factors are strongly correlated with transnational terrorism, even when accounting for country-level variables. With increasing degrees of each attribute, we expected the prospects of an attack occurring locally to increase. Our analyses offer some evidence that this is a reasonable contention. While transnational attacks often reach across borders, many of the factors that influence the attacks are local.

The primary purpose of this study is to provide an initial look at how subnational factors are associated with transnational terrorism. Our analysis should thus be seen as a first step towards a more comprehensive analysis of a set of theoretical expectations based on specific research questions and theories. In particular, we did not attempt to address endogeneity, which is a challenge with all observational data, but is beyond the scope of this paper. Nevertheless, we recognize the need for future work in this area to examine the precise impact of these processes in a more constrained way and to make sure the results hold across different contexts. The case illustrations, included in the online appendix, reduce some of the complexity by examining individual countries, and may be the basis for future work that could then apply more rigorous identification strategies in controlled settings.

There are a number of other analytical extensions that could be considered. Scholars could analyze more complex, potentially interactive relationships such as whether civil conflict is occurring across the border in the neighboring state that could unpack some future results. Our multilevel modeling was a first attempt at this, but future cross-border and cross-level tests are quite feasible. Furthermore, a future direction is to examine the subnational variation of different modes of transnational terror attacks. For example, we have not unpacked any of the differences between, for instance, hijacking versus assassinations. Just like types of crime, we suggest that these different modes of attack might have different logics of target selection.

Moving forward, we expect that our approach could be used for risk analysis or to predict out-of-sample locations that are particularly attractive to groups that utilize terrorism. Similar to efforts by police departments to map crime, this approach could be used by homeland security professionals to evaluate locations that are more likely target than others. With the expansion of ISIS beyond the Middle East, and the activity of numerous other transnational terrorist groups, the U.S. and many other countries should be particularly interested in understanding transnational terrorism targeting. Given increasing concerns in academe about engaging policymakers, this approach also provides important clues about the location of transnational terrorism targeting.

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