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**Determinants of Terrorism: Assessing the Impact of Geographic Fragmentation Based on the Socio-Economic Framework**

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# Determinants of Terrorism: Assessing the Impact of Geographic Fragmentation Based on the Socio-Economic Framework

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## Abstract

*This paper analyzes the effect of the level of geographic fragmentation in the number of terrorist attacks within a country per year controlling for socio-economic determinants evaluated in previous literature. In order to do this, we use different counting methodologies as zero inflated negative binomial distribution models over 128 countries between 1971 and 2005. This allows us to provide robust evidence that corroborates the hypothesis, this is, a consistent positive effect and statistical significance which varies adding time and geographic region controls according to historical events that have caused significant increases in the number of terrorist attacks across countries. Our findings provide insight into an additional factor in the study of the determinants of terrorism.*

*JEL: C25, H56, D74*

*Keywords: determinants of terrorism, fragmentation, fractionalization, counting models, zero inflated models.*

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## I. Introduction

Since September 11 of 2001 there is a growing interest in understanding the different determinants of terrorism across countries. From the beginning the media and the general public were very receptive to research lines that remarked the importance of, in the first place, the political underdevelopment and in subsequent studies the poor socio-economic conditions. It is essential then make clear what are the causes of terrorism because this phenomenon certainly implies strong delays in economic and social development, in other words, the immediate damage of a terrorist attack may be marginal but this phenomenon gradually acquire substantial political and social costs (Abadie and Gardeazabal, 2003; Gupta et al., 2004; Crain and Crain, 2006; Gaibulloev and Sandler, 2008). More specifically, some of those consequences are the reduction of international trade (Nitsch and Schumacher, 2004), immigration issues (Dreher et al., 2011), reduction on FDI (Enders and Sandler, 1996), a direct impact on many economic activities such as tourism (Enders et al., 1992), and of course a decline in the individual and collective life satisfaction (Frey et al., 2009).

This study aims to present evidence that poor socio-economic conditions as a cause of nonconformity of the population with central governments are accompanied by a geographical fragmentation factor that increases such nonconformity. That is, the geographical fragmentation usually leads to lower government presence throughout the national territory (in line what is presented by Bandyopadhyay and Younas (2011)) which means a poorer socio-economic conditions for settled communities and ultimately that encourages outlaw forces to using the complexity of the territory in order to strengthen and increase their operational capability against the central government (this argument agrees in the socio-economic issue remarked by Freytag et al. (2011), and then with the terrorist response to nonconformity pointed out by Crenshaw (1981) and Krueger and Malečková (2003)). In fact, Okafor and Piesse (2017) carried out a recent research in which they measured how prone a country becomes to terrorism according to the fragility of the state (linked to its inability to manage power throughout the national territory). This phenomenon not only causes domestic but also transnational terrorism as in the Colombian case where the group FARC was operating from Ecuadorian and Venezuelan territory (evidenced in the Raul Reyes fall operation).

To capture these effects it is used the Geographic Fragmentation Index (GFI) implemented by Canavire-Bacarreza et al. (2016) in their contribution regard decentralization and the index is calculated taking into account the weighted average probability to find two individuals in different geographical areas within one country. This index can be biased by differences in total area dimensions between countries and with the aim of capturing this effect will be used the GFI in interaction with the total area as an addition to the estimates.

Following the main thesis of this article presenting the geographical fragmentation as an element that increases the number of terrorist attacks at generating absence of the

government throughout the national territory, robustness checks are performed interacting the mentioned variable (GFI\*area) with two other variables to ensure the statistical significance of this political associated phenomenon. On the one hand, according to the review presented by [Krieger and Meierrieks \(2011\)](#) and specific arguments such as the one in [Li \(2005a\)](#) (which will be explain in following sections) the level of democracy represents to some extent the behavior of the government and it is correlated with terrorism, therefore, an interaction of this index with our proposed variable will be presented. In fact, [Abadie \(2004\)](#) provides evidence that greater political freedom increases the terrorist conduct particularly in periods of transition from an authoritarian regime to a democratic one. On the other hand, according to the literature, an element that could capture this effect of greater absence of the state is the level of political and fiscal decentralization in the country, in literature there are conflicting positions about the federalism and its effect on terrorism but few empirical estimates; for this reason and following the approaches of [Frey and Luechinger \(2004\)](#) that support the inclusion of this variable, we assess the effect of federalism as an interaction to our proposed variable taking into account that there is even less literature that has evaluated the federalism in a socio-economic context and its impact on the number of terrorist attacks.

With this study we contribute to academic discussion related to the determinants of terrorism, first providing support on the idea that terrorism depends at least in part, in a set of variables that reflect the poor socio-economic environment of the communities that tend to rise weapons in response thereto<sup>1</sup>. This part of the study is focused on the paper presented by [Freytag et al. \(2011\)](#) which is an approach on these determinants based on the opportunity cost of terrorism. In turn, noting that the factors that help increase the opportunity cost of terrorism (eg, socio-economic growth) have the potential to significantly reduce violent behaviors of communities.

Second, we provide empirical evidence in relation to our geographical fragmentation hypothesis as a determinant of terrorism, we do it taking into account the socio-economic situation of 128 countries between 1971 and 2005. Following previous studies and according to the points mentioned above, we use a database reporting domestic and transnational terrorism. We found that geographical fragmentation makes more attractive terrorist behavior and its effect is consistent across methods, also by introducing regional dummies and mainly temporal dummies depicting historical events that have caused significant increases in the number terrorist attacks per year. Our findings on the geographical fragmentation variables support literature that remarks the importance of total government presence throughout their national territory in order to increase the opportunity cost of violent behavior and the generation of illegitimate groups that use the terrorism as a means to achieve their objectives. The paper is organized as follows: Section **II** surveys some relevant previous research refers to the study of terrorism from which we select our variables to control for socio-economic conditions.

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<sup>1</sup>To be more specific, these variables reflects for instance poor social welfare policies, economic discrimination and low levels of international commerce ([Burgoon, 2006](#); [Blomberg and Hess, 2006, 2005](#); [Krieger and Meierrieks, 2010](#); [Caruso and Schneider, 2011](#)).

Section III presents methodology and data used. Section IV presents our findings and respective analysis. Section V concludes.

## II. Determinants of terrorism: a review

A generally accepted definition of terrorism is “the deliberate use of violence and intimidation directed at a small group of people to coerce a community (government) comprising demands political or ideologically motivated” (Krieger and Meierrieks, 2011). In the mainstream terrorists’ interests are usually divided on short and long term interests; according to Tavares (2004), the short-term interests are: 1) gain publicity and media attention, 2) destabilize the political system and 3) damage the economic system. According to Frey and Luechinger (2004), the long-term interests are seeking redistribution of power, wealth and influence.

According to the above, in the economic study terrorist is treated as a rational subject, ie, terrorists behave as the *homo economicus* (Caplan, 2006) and that implies that terrorist acts are nothing but a search of the individual to maximize their profit taking certain restrictions, costs and benefits like any other economic decision (Sandler and Enders, 2004). According to Frey and Luechinger (2004), benefits from terrorism are derived to achieving tactical and strategic objectives of each attack, and costs are derived from the invested resources and the opportunity cost of violent behavior.

### II.I Schools of thought: commonly accepted hypothesis

According to the points made by Krieger and Meierrieks (2011), conditions of each country alter both the costs and the benefits of terrorist behavior and therefore the level of attacks occurring. Given the above, in the economic literature there are several schools of thought that have presented global assumptions about the main determinants of terrorism<sup>2</sup>. The first global hypothesis emphasizes the role of *economic deprivation*, that is, poverty and inequality between countries. Gurr (2015) presented the idea of “relative deprivation” in which the individual decides to become a terrorist when comparing what he thinks he deserves with what is already receiving through the distribution process of the economy. In other words, poor economic conditions create frustration through society and that leads to the generation of violent behavior.

Another global hypothesis is focused on what scholars have called the *modernization* process. Following Krieger and Meierrieks (2011), a modernization process which involves economic change (accompanied by economic growth in some sectors and not in others), new forms of communication and lifestyles, as well as new social ideas. According to Robison et al. (2006), these factors can create grievances associated with socio-economic or demographic tensions. For example, the modernization process can

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<sup>2</sup>This does not imply that global hypothesis contradict each other. Conversely, they complement and each comprise a remarkable contribution to literature.

create new jobs in certain economic activities as well as many jobless in more traditional activities and this can be translated into incentives to use weapons as an alternative means of achieving certain objectives. In other words, tensions occur during the process of changing from a traditional society to a modern (Ross, 1993). However, as highlighted by Krieger and Meierrieks (2011) these changes are difficult to capture in empirical analysis and for this reason some commonly accepted variables have been used such as education level and population growth with respect to demographic change.

Also, as remarked in previous section, there is an important segment of the literature emphasizing that poor socio-economic conditions are determinants of terrorist conduct reflected in, for example, inadequate social welfare policies, economic discrimination and low levels of economic openness (Burgoon, 2006; Blomberg and Hess, 2006, 2005; Krieger and Meierrieks, 2010; Caruso and Schneider, 2011). Poor socio-economic conditions significantly reduce the opportunity cost of terrorism. Considering the above, this study used the variables commonly used to capture socio-economic conditions and enter a variable to capture the effect of geographic fragmentation on estimations. Theory that closest supports the introduction of variables with this nature is briefly described at the end of this section.

*Political and institutional order* is also one of the global accepted hypothesis in literature. According to Li (2005a), democratic regimes can offer different nonviolent methods for nonconformist groups express their ideas but are unable to make strong resistance to terrorism when it is already in operation by its obligation to continue respecting certain civil liberties. However, there is no consensus on what is the political system that best reduces the likelihood of emerging terrorist acts. In any case, it is clear that the way institutions are established in each country influence the cost-benefit calculation of potential terrorist agents. On the other hand, according to Bjørnskov et al. (2008) decentralization increases the well-being of individuals and Frey and Luechinger (2004) emphasize that decentralized countries are more stable than the centralized countries in political and administrative terms. In fact, arguments are found in literature that support the idea that the federalist countries tend to be more efficient in the governance activity and in the administration of security (Brennan and Buchanan (1990), Tiebout (1961)); with this, our research aims to present as robustness check empirical evidence of the referred effects by using the classification of federal countries implemented by Treisman (2002) in interaction with the geographical fragmentation index.

*Instability and political transformation* are also generally accepted as causes of terrorism because, as argued by Krieger and Meierrieks (2011), political instability creates gaps which terrorist groups can take advantage because the opportunity cost of terrorism decreases. That is, instability and political transformation tend to amplify terrorist behavior. On the other hand, Huntington (1996) remarked that *civilizational clash* also generates terrorist acts. With this Huntington (1996) refers to differences in religious or ethnic nature can create disputes both within a country and between countries with different ideologies organized (such as the recent conflict between ISIS and the mainly

Christian Western countries). A religious determination can eliminate any moral restraint and contributes to the cohesion of terrorist organizations, which makes the least expensive and most effective terrorist conduct (Bernholz, 2006).

*The global economic and political order* (globalization) is also one of the commonly accepted determinants remarked by Krieger and Meierrieks (2011). Economic integration (measured by the commercial opening), foreign policy, as well as the alliances between countries can wake up great discontent in a sizable segment of the population that in the absence of alternatives take up arms as a sign of his opposition (Bergesen and Lizardo, 2004). In fact, this phenomenon can lead to transnational terrorism when an ally of the government suffers from terrorist attacks by an insurgent group because of the support that this country is making to its ally (Addison and Murshed, 2005), and of course terrorism is also submitted to the confront of two different ideologies between countries as was reported in the Cold War (O’Brien, 1996).

Finally, the closest global hypothesis to the central theme of this research is *contagion*. The main idea of this hypothesis is that terrorism is strengthened with regard to time and space (Midlarsky et al., 1980). Many authors have submitted studies on the temporal and geographical contagion, some of them are Lai (2007), Plümper and Neumayer (2010), Hess and Blomberg (2008), Enders and Sandler (2005), and Piazza (2007). The temporary contagion emphasizes that terrorism past may come back in the present, for example for organizations such as FARC was much more cost effective to carry out a terrorist campaign with continuous attacks. The spatial contagion, as defined by Krieger and Meierrieks (2011), means that if a country suffers from terrorism is likely to generate terrorism in its neighboring countries. However, the geographical position differs substantially from the hypothesis of our research in which we will try that the geographical fragmentation of each country reduces the opportunity cost the terrorist organizations because there is no central government that does presence throughout the territory and that presents a substantial opportunity for these groups to consolidate and strengthen.

### III. Methodology and data

In this section we specify the data used and the method to evaluate if our hypothesis about the geographical fragmentation has validity using features within the countries in terms of socio-economic conditions. According to Freytag et al. (2011), a legitimate assumption is that macroeconomic variables are correlated with terrorism since the level of violence is not only related to individual consideration on the cost of opportunity but also to the support communities provide to the individual terrorist (organization), which in turn depends on the socio-economic conditions<sup>3</sup>.

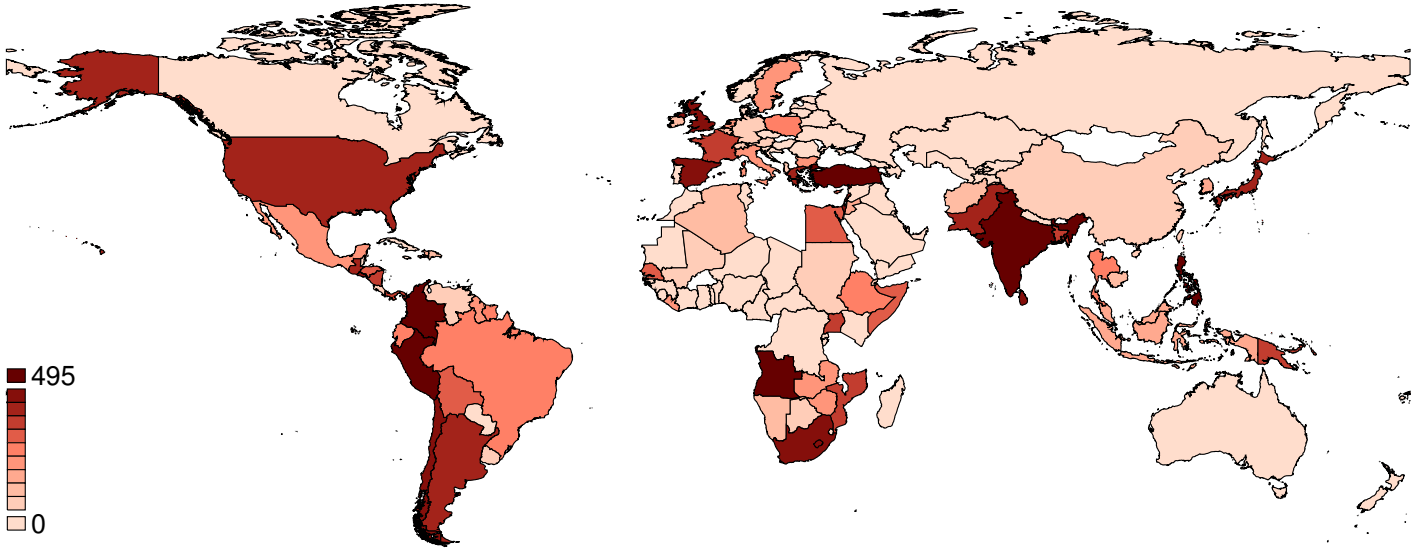
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<sup>3</sup>Bueno de Mesquita and Dickson (2007) presented a detailed study on popular support to terrorism.

### III.I Measuring Terrorism

Our dependent variable is the number of terrorist attacks (domestic and transnational) in a given country for each year. This information was collected for 128 countries between 1971 and 2005. The building itself is a variable with data from *Global Terrorism Database* (LaFree and Dugan, 2007). It is important to clarify that the transnational terrorism is affected by international variables (Dreher and Gassebner, 2008; Savun and Phillips, 2009) and these variables little affect domestic terrorism (e.g., Savun and Phillips (2009)). However, following Freytag et al. (2011) what is intended in these types of studies is an analysis based solely on the socio-economic framework.

**Figure 1:** Level of terrorist attacks in 1990 for the 128 countries available



### III.II Measuring Geography

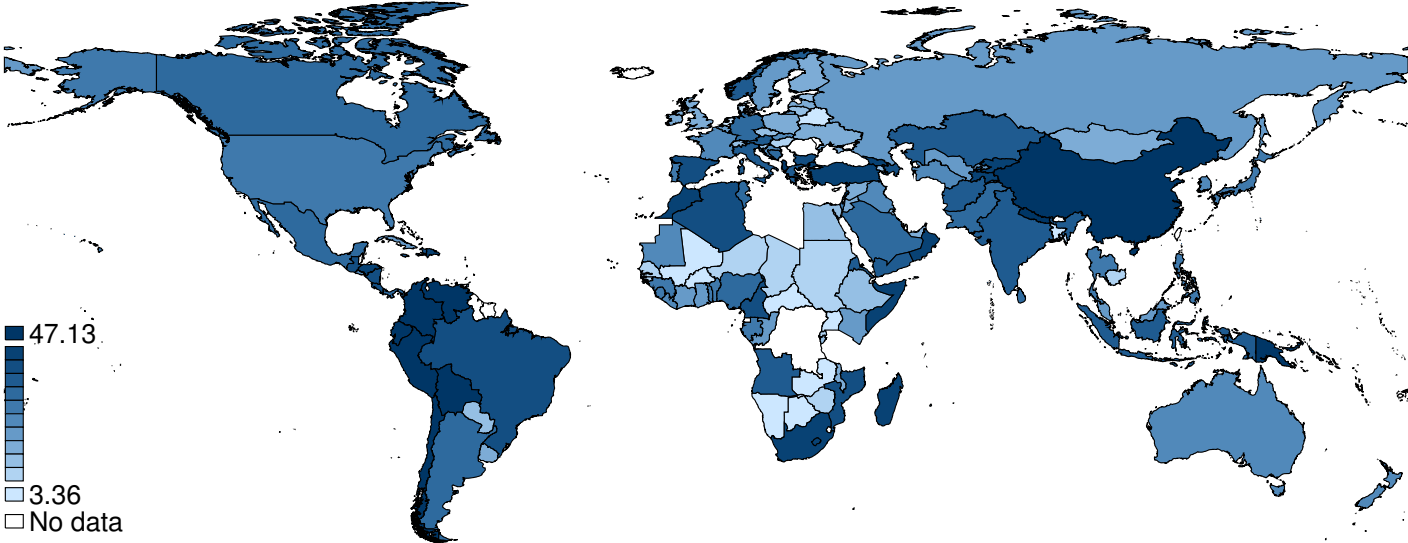
We measure geography in two interacting dimensions: First, through a Geographic Fragmentation Index (GFI), previously developed by Canavire-Bacarreza et al. (2016); and second through country area. The index reflects the weighted probability that two individuals taken at random in the country do not live in similar altitude zones, with the weight matrix calculated as the average distance between altitudes. Thus the index is simply calculated as:

$$1 - \sum_{j=1}^J \sum_{i=1}^N (W_{ij} \frac{n_i}{N})^2, \quad (1)$$



Where  $\frac{n_j}{N}$  is the share of population by elevation and  $W_{ij}$  measures the distance between altitude  $i$  and altitude  $j$ . This measure goes from zero, which corresponds to a case where all the population is settled in the same altitude zone, to one which corresponds to the implausible case where each individual lives in a different altitude. In general, geographical fragmentation will increase with the number of altitude-zones and the more equal weights for each group<sup>4</sup>. It can also be the case of geographical fragmentation is enhanced with country size, and to allow for that we interact the geographical fragmentation index with country land area. Figure 2 shows the geographical fragmentation index ranked from countries that are less fragmented (i.e. Belarus, Paraguay) to countries that show high levels of geographical fragmentation (i.e., Colombia, China, or Switzerland). In order to use the logged variable appropriate for the zero inflated negative binomial estimation, which is explain in the following section, and do not incur in negative values the index is then multiplying by 100 as is presented in table 1.

**Figure 2:** Map of geographical fragmentation index for the 128 countries available

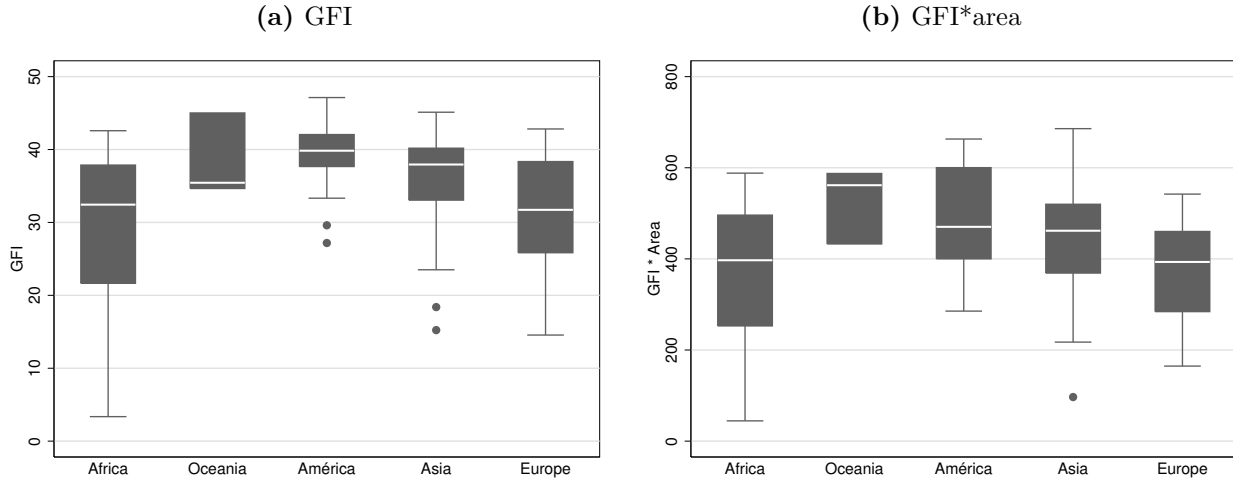


Source: Martinez-Vazquez and Yedgenov Canavire-Bacarreza, (2015)

At this point it is important data analysis by region. In figure 3 is noted that Geographical Fragmentation Index (GFI) without interaction with area presents four outliers, two in America and two in Asia. To be more precise these outliers are Paraguay, Uruguay, Singapore and Bangladesh. However, according to figure 3 the variable GFI interacting with total area only presents an outlier (i.e Singapore) which benefits considerably estimates and should be taken into account when analyzing results.

<sup>4</sup>The methodology applied for the index is similar to the one applied by Gallup et al. (2003) for geography and that applied by Hudson (1972) for population

**Figure 3:** Box plot for GFI and GFI\*area by continental region



### III.III Measuring socio-economic conditions

The main set of socio-economic variables are taken from the *Penn World Table* (e.g., [Summers and Heston \(1991\)](#)). According to [Freytag et al. \(2011\)](#), we included real GDP per capita and its square since, on the one hand, a higher per capita income tends to reflect a greater capacity of the state (e.g., [Fearon and Laitin \(2003\)](#)). What this implies is that it decreases the likelihood of open rebellion, but at the same time, according to [Blomberg et al. \(2004\)](#), increases the likelihood of a clandestine activity. The relationship is non-linear, then at the beginning is expected to have a positive effect on the possibility of clandestine activity but later it is expected a negative effect by a simple income effect related to the opportunity cost mentioned above.

The aggregate level of consumption (consumption as a percentage of GDP) is simply used because high levels of consumption represent better socio-economic conditions on the demand side (e.g., [Headey et al. \(2008\)](#)). At the same time, the level of openness decreases the levels of terrorist attacks being correlated with greater economic growth and an improvement in the socio-political conditions (e.g., [Levine and Renelt \(1992\)](#); [Dollar and Kraay \(2004\)](#)). In the same way, higher levels of investment (investment as a percentage of GDP) imply a greater economic participation, economic growth and therefore better socio-economic conditions (e.g., [Levine and Renelt \(1992\)](#)). Finally, according to [Blomberg et al. \(2004\)](#), in times of little economic growth the terrorist behavior tends to be more attractive because of its low opportunity cost and it is the reason we introduce the annual rate of economic growth.

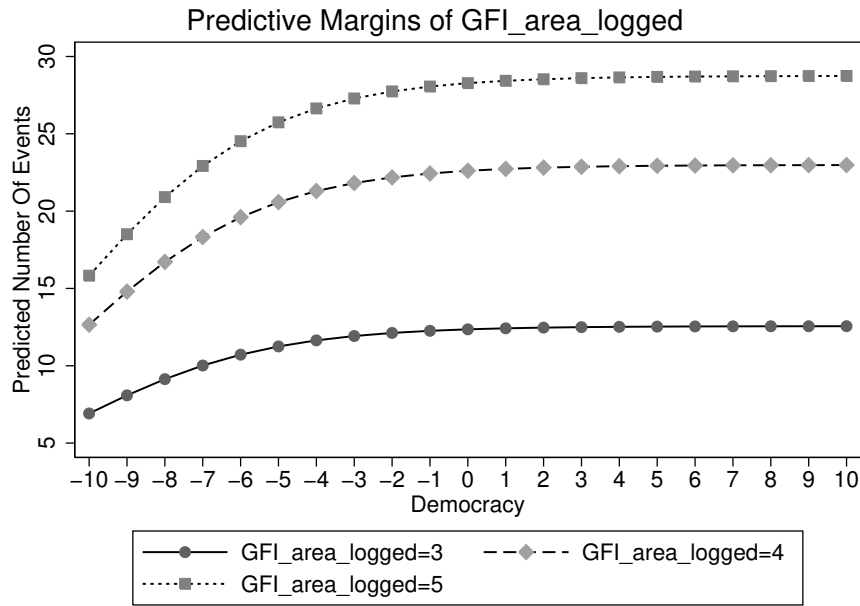
### III.IV Controls

According to [Krieger and Meierrieks \(2011\)](#), we use some non-economic variables as controls in the estimates. The first of these is a variable as a proxy for the level of democracy in the countries, according to this author, there is no consensus on the effect of democracy on the level of terrorist attacks since, on the one hand, democracy offers higher levels of participation and legitimate channels to express grievances. On the other hand, democracy provides more liberties which makes the terrorist behavior less costly. In addition, [Li \(2005b\)](#) argues that democracies tend to have institutions that limit political and military actions of the government to suppress directly insurgent groups which reduces the opportunity cost of these groups at the time of deciding to become terrorists. Is chosen then the rate of political development *Polity2* (from *POLITY IV* project) although, according to [Freytag et al. \(2011\)](#), it is assumed the potential bias of this variable with respect to the dependent variable being collected from media, that is, that democracies tend to put less restrictions on dissemination of information than other social systems. With our data there is a clear positive relationship between the level of democracy and terrorist attacks (figure 4) maximized by the geographical fragmentation of the countries, this gives us a first indication of the GFI influence in terrorist behavior. See appendix [A.I](#) to find confidence intervals and statistical significance associated to each interval.

However, [Piazza \(2008\)](#) found that political instability cause terrorist since for those groups outside the law is easier to attack new regimes that are not consolidated and they do not have much support, here is used the number of years since the most recent change of regime, a variable from the *POLITY IV* project. In figure 5 is presented this variable in interaction with GFI\*area (logged). See appendix [A.II](#) to find confidence intervals and statistical significance associated to each interval.

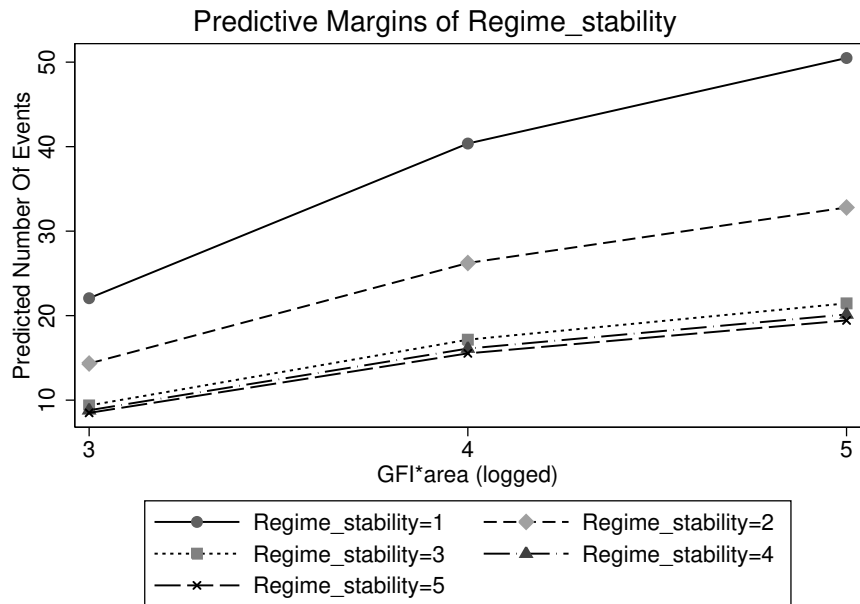
According to [Kirk \(1983\)](#), greater government size makes terrorist behavior attractive because it implies higher economic and political rents that are generally the interests of this type of illegitimate groups. It is used the component of the government (as a percentage of GDP) submitted by *Penn World Table*. Similarly, according to [Krieger and Meierrieks \(2011\)](#), terrorist behavior is more likely in countries with greater population because this means demographic, ethnic tensions and more difficult for the government to enforce the law throughout the national territory. It is used the population size presented also by *Penn World Table*. Finally, according to [Merari \(1993\)](#), countries in times of civil war present much higher levels of terrorist attacks, then, it is a variable that is expected to be statistically significant and especially in its interaction with our geographical fragmentation variable as shown in figure 6. For this variable data from UCDP/PRIO Armed Conflict Dataset is taken, and it will be a dummie variable which takes the value 1 if the internal conflict takes at least 1000 victims per year. See appendix [A.III](#) to find confidence intervals and statistical significance associated to each interval in figure 6.

**Figure 4:** Margins plot of terrorist attacks by democracy and GFI\*area (logged)

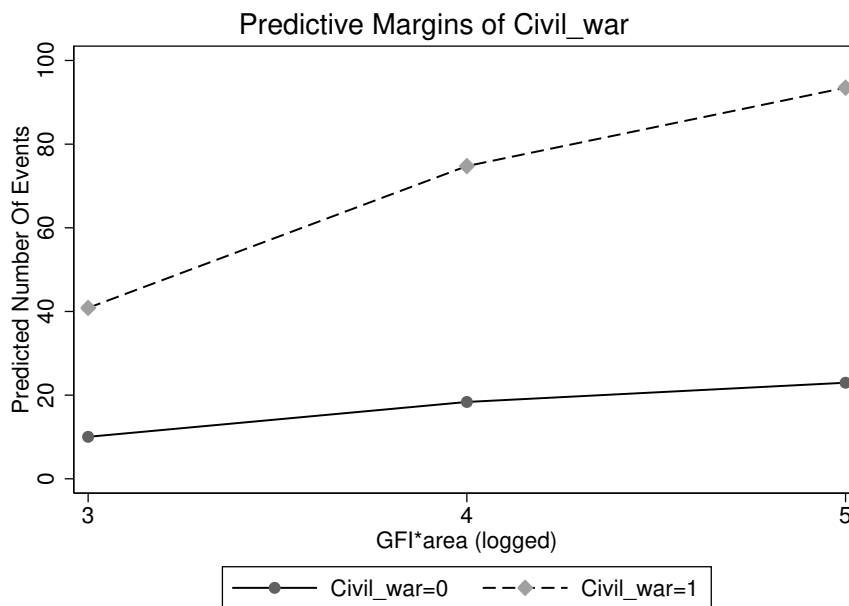


Note: discretized variable in a rank of five taking the values from zero to the highest value of the variable.

**Figure 5:** Margins plot of terrorist attacks by regime stability and GFI\*area (logged)



**Figure 6:** Margins plot of terrorist attacks by civil war and GFI\*area (logged)



**Table 1:** Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Total terrorist attacks	5220	14.69732	54.13488	0	710
Geographic Fragmentation Index (logged)	4608	3.456484	0.3797782	1.211915	3.852882
GFI*Total area (logged)	4608	5.966781	0.4272635	3.794779	6.530587
Population (logged)	5220	9.010988	1.620574	4.491161	14.08272
Real GDP per capita (logged)	4831	8.499361	1.160437	5.033303	11.48908
Trade openness (logged)	4831	4.04888	0.7022133	0.082522	6.100463
Consumption (logged)	4831	4.123469	0.3672235	1.621194	5.530619
Government size (logged)	4831	2.796318	0.4828129	0.3631031	4.220289
Investment (logged)	4827	2.806613	0.7033434	-0.6996688	4.502944
Economic growth	4784	1.711539	7.704825	-65.02475	131.2425
Civil war	5220	0.0519157	0.2218781	0	1
Democracy	4631	0.6324768	7.435315	-10	10
Regime stability	4676	22.16681	28.86139	0	196
Federal	5220	0.1586207	0.365357	0	1

Note: See appendix [A.VI](#) where countries in the study are reported

### III.V Methodology

Having a dependent count variable (the number of terrorist attacks by year and country) it is necessary to apply a regression method designed for this type of variables. Now, given the nature of the variable there are two important aspects that need to be modeled: first, according to [Freytag et al. \(2011\)](#), the overdispersion feature allows

us to use a *negative binomial model* instead of a Poisson model type<sup>5</sup>. See appendix [B.I](#) on dispersion evidence related to the level of political development (Democracy). As highlight by [Krieger and Meierrieks \(2011\)](#), this type of models are useful tools in the study of terrorism. Second, having a dependent variable highly inflated at zero makes essential to introduce a binary model that captures the variable that cause in large measure a sustained absence of terrorism and allows the count negative binomial model capture the determinants of the level of terrorist attacks. See appendix [B.II](#) to find histograms as evidence of a dependent variable highly inflated to zero.

The variable on the level of democracy (taken from the *Polity IV project*) becomes crucial in the zero inflated negative binomial estimations because after applying the [Vuong \(1989\)](#) test and analyze the behavior reflected in figure [4](#) it is presented as the indicated variable for the binary component of the model. In some models regional and year dummies are included to capture heterogeneity and serial correlation. Future changes will be implemented in robustness check sections ([IV.II](#) and [IV.III](#)).

## IV. Empirical Results

### IV.I Main results

First of all, preliminary results are presented in table [2](#) for OLS to have a first overview of the effects generated by our geographical variables, such as the socio-economic variables and additional controls implemented. As noted in table [2](#), preliminary results show a positive and significant effect for geographical fragmentation variables, for both GFI to GFI in interaction with the total area, through the different additional controls (temporary and regional dummies). Thus, the socio-economic variables are in line with the findings of [Freytag et al. \(2011\)](#) which in these early estimates by OLS, as expected, do not have the expected significance because the estimates not model the dispersion as well as the high number of zeros in our dependent variable. However, checks associated with political variables as the regime stability also have an expected direction of the effect, it is important to recognize that the civil war variable has a very big influence in terrorist attacks, a magnitude to take into account in subsequent estimates.

When analyzing table [3](#), as discussed earlier in the hypothesis of this study, a positive and significant effect at the 1% between geographical fragmentation variables and the number of terrorist attacks after zero inflation negative binomial estimates is presented. These results are consistent between models in which the Geographical Fragmentation Index (GFI) and national total area used separately (models 1, 2, 3), as well as in those that use both variables in interaction (GFI\*area). However, there is a change of magnitude in the effects of the first three models previously mentioned in comparison with the last three models. Looking at margins of table [4](#) is noted, with regard to the

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<sup>5</sup>[Cameron and Trivedi \(2013\)](#) for a more detailed description of this type of models of counting.

**Table 2:** OLS estimations (preliminar approach)

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS					
Real GDP per capita t-1 (logged)	98.26*** (11.12)	91.55*** (10.49)	84.77*** (10.07)	100.4*** (11.20)	92.17*** (10.56)	85.31*** (10.13)
Real GDP per capita t-1 (sq,logged)	-5.494*** (0.646)	-5.119*** (0.612)	-4.772*** (0.589)	-5.605*** (0.650)	-5.159*** (0.616)	-4.808*** (0.593)
Economic growth t-1	-0.212* (0.113)	-0.216* (0.118)	-0.110 (0.114)	-0.219* (0.114)	-0.222* (0.119)	-0.115 (0.115)
Population t-1 (logged)	4.691*** (0.741)	3.986*** (0.711)	4.514*** (0.725)	4.592*** (0.766)	3.898*** (0.716)	4.373*** (0.731)
Consumption t-1 (logged)	5.993** (2.501)	9.146*** (2.779)	6.896** (2.708)	5.975** (2.482)	9.102*** (2.742)	6.912*** (2.670)
Investment t-1 (logged)	-1.137 (1.049)	-0.811 (1.117)	-1.613 (1.162)	-1.031 (1.045)	-0.916 (1.117)	-1.700 (1.163)
Government size t-1 (logged)	2.777* (1.531)	2.981* (1.594)	1.627 (1.623)	2.527* (1.532)	2.605* (1.577)	1.248 (1.608)
Trade openness t-1 (logged)	-10.26*** (1.263)	-10.76*** (1.220)	-8.595*** (1.174)	-10.32*** (1.254)	-10.69*** (1.219)	-8.522*** (1.173)
Regime stability t-1	-0.0255 (0.0312)	0.0130 (0.0350)	-0.00633 (0.0347)	-0.0296 (0.0315)	0.0115 (0.0350)	-0.00776 (0.0347)
Democracy t-1	1.102*** (0.133)	1.215*** (0.154)	1.405*** (0.162)	1.104*** (0.133)	1.204*** (0.155)	1.395*** (0.163)
Civil war	64.65*** (8.352)	65.24*** (8.554)	62.55*** (8.374)	64.74*** (8.370)	65.38*** (8.561)	62.67*** (8.380)
GFI (logged)	8.643*** (1.370)	6.494*** (1.351)	6.512*** (1.376)			
GFI*Area (logged)				5.320*** (1.490)	3.874*** (1.484)	4.201*** (1.521)
Constant	-478.3*** (46.47)	-451.7*** (45.49)	-428.2*** (44.12)	-488.4*** (47.70)	-453.4*** (45.90)	-431.4*** (44.53)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	3,949	3,751	3,751	3,949	3,751	3,751
R-squared	0.165	0.173	0.201	0.163	0.172	0.200

Note: dependent variables is total terrorist attacks within a country per year. Robust standard errors in parentheses;  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

discretized variable GFI<sup>6</sup>, a growing positive relationship with exception on the fourth level and this may be due mainly to the outliers or the omission of an effect associated with the national total area. This is captured later in the variable GFI\*area (as well as in the discretized variable GFI\*area) and the margins presented in table 4 show a positive relationship growing from the first level (beginning at the third). This is according to the results presented by [Canavire-Bacarreza et al. \(2016\)](#) in their study on decentralization.

The objective of this study is not to further analyze the socio-economic conditions and other variables used as controls, but it is worth noting that the effects of the variables are according to the results presented previously in the literature with exception on consumption which has the opposite effect. Investment and trade openness

<sup>6</sup>See the note in table 4 for a further description.

**Table 3:** Zero-inflated negative binomial estimations

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
Negative binomial						
Real GDP per capita(logged)	5.626*** (0.730)	3.918*** (0.744)	4.332*** (0.697)	5.957*** (0.764)	3.952*** (0.777)	4.405*** (0.722)
Real GDP per capita (sq,logged)	-0.292*** (0.0416)	-0.199*** (0.0430)	-0.224*** (0.0403)	-0.308*** (0.0437)	-0.200*** (0.0450)	-0.227*** (0.0418)
Economic growth	-0.0220*** (0.00630)	-0.0218*** (0.00633)	-0.0151*** (0.00524)	-0.0229*** (0.00641)	-0.0225*** (0.00641)	-0.0159*** (0.00532)
Population(logged)	0.497*** (0.0367)	0.557*** (0.0378)	0.543*** (0.0387)	0.470*** (0.0381)	0.553*** (0.0403)	0.538*** (0.0414)
Consumption(logged)	0.770*** (0.146)	0.417** (0.171)	0.215 (0.173)	0.787*** (0.139)	0.342** (0.167)	0.147 (0.169)
Investment(logged)	-0.270*** (0.0872)	-0.319*** (0.0957)	-0.237*** (0.0867)	-0.277*** (0.0858)	-0.354*** (0.0951)	-0.265*** (0.0844)
Government size(logged)	0.680*** (0.0997)	0.707*** (0.0970)	0.606*** (0.0911)	0.698*** (0.100)	0.702*** (0.0953)	0.594*** (0.0897)
Trade openness(logged)	-0.765*** (0.0686)	-0.712*** (0.0695)	-0.859*** (0.0705)	-0.781*** (0.0712)	-0.728*** (0.0701)	-0.875*** (0.0695)
Regime stability	-0.00763*** (0.00119)	-0.00677*** (0.00129)	-0.00416*** (0.00125)	-0.00849*** (0.00122)	-0.00749*** (0.00133)	-0.00486*** (0.00127)
Civil war	1.574*** (0.120)	1.485*** (0.122)	1.465*** (0.121)	1.621*** (0.122)	1.517*** (0.124)	1.501*** (0.122)
GFI (logged)	1.024*** (0.140)	0.728*** (0.147)	0.675*** (0.138)			
GFI * Area (logged)				0.645*** (0.119)	0.380*** (0.131)	0.329*** (0.123)
Constant	-33.53*** (3.042)	-24.50*** (3.080)	-26.19*** (2.902)	-35.21*** (3.107)	-24.03*** (3.212)	-25.84*** (2.980)
Inflate						
Democracy	-0.348*** (0.0244)	-0.381*** (0.0289)	-0.395*** (0.0293)	-0.350*** (0.0245)	-0.385*** (0.0293)	-0.398*** (0.0299)
Constant	-3.344*** (0.184)	-3.648*** (0.222)	-3.887*** (0.231)	-3.375*** (0.185)	-3.706*** (0.226)	-3.952*** (0.236)
$\alpha$	1.211*** (0.0323)	1.184*** (0.0324)	1.050*** (0.0331)	1.233*** (0.0324)	1.200*** (0.0325)	1.066*** (0.0330)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869

Note: Dependent variable is total terrorist attacks within a country per year.  $\alpha$  indicates the overdispersion parameter of the negative binomial type II distribution. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

are according to what is reported by [Freytag et al. \(2011\)](#), [Hess and Blomberg \(2008\)](#) and [Kurrild-Klitgaard et al. \(2006\)](#), the non-linear effect of the GDP per capita is going according to [Lai \(2007\)](#). Political variables included (democracy, regime stability and civil war) are in line with the different studies reported in [Krieger and Meierrieks \(2011\)](#). Population as a demographic determinant also goes according to authors such as [Burgoon \(2006\)](#) and [Lai \(2007\)](#). Finally, the effect associated to larger government



**Table 4:** Margins for GFI\*area and Distance to port

GFI (logged)	Margin	[95% Conf. Interval]		GFI*area (logged)	Margin	[95% Conf. Interval]	
1				1			
2	11.506** (5.101)	1.508	21.503	2			
3	30.802** (13.349)	4.639	56.965	3	11.944** (5.317)	1.523	22.365
4	17.341*** (2.703)	12.043	22.639	4	21.855*** (4.282)	13.462	30.248
5	27.473*** (2.040)	23.475	31.471	5	27.333*** (2.067)	23.282	31.384

Note: Discretized variable in a rank of five taking the values from zero to the highest value of the variable. Margins at means. Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

continues what [Kirk \(1983\)](#) pointed out. In summary, these variables range according to the study conducted by [Freytag et al. \(2011\)](#) in terms of socio-economic conditions.

#### IV.II Robustness

In this section we remark the results of the estimates with temporal cluster variance, that is, a cluster variance for each year from 1971 to 2005. This since the history of the twentieth century was marked by stages in which the countries suffered many terrorist attacks by political and ideological differences. For example, the decade of the 80's presents statistical significance in the estimates to the 1% mainly due to international conflicts related to the Cold War, the nations involved and the different geopolitical disputes of the time. In table [C.II](#) estimates are presented without very significant changes in the results continuing with the intuition previously raised from previous results.

In the second place, according to the arguments mentioned in previous sections with respect to the mechanism of transmission about the geographical fragmentation towards the number of terrorist attacks per year, this is, that the geographical fragmentation prevents the total government presence throughout the national territory and political freedom is accompanied by a nonconformity that leads to the creation of terrorist groups, we performed a robustness check interacting our proposed variable (GFI\*area) with the level of democracy. Because the index from the *Polity IV project* includes values between -10 and 10 it is necessary to rescale the index in order to avoid sign problems. In addition, since the variable for democracy is discrete the inclusion of it as a separate regressor generates strong problems of colinearity and therefore is not included in the estimates. Table [5](#) shows the consistency of the estimates for both the variable previously used and the new interacted variable, the latter introduces a coefficient considerably smaller but significant at 1%. This is accompanied by a very interesting phenomenon which is in line to a point raised by [Abadie \(2004\)](#) where the terrorist

attacks increase in periods of transition toward a democracy; as new contribution is presented the significant increases according to the level of geographical fragmentation. This is contained in figure 7. See Appendix A.IV to find confidence intervals and statistical significance associated with each interaction.

#### IV.III Further robustness checks

One criticism may be that the level of democracy (or of political freedom) of the countries do not fully capture the partial absence of government in the national territory. To do this, a measure on greater decentralization seems to be a good alternative according to the contributions of Frey and Luechinger (2004), Brennan and Buchanan (1990) and Tiebout (1961) where it is stressed that the decentralized countries are more stable than the centralized countries in political and administrative terms. It then used a dummy that records the countries with federal systems taken from Treisman (2002) with the addition of Micronesia and Papua New Guinea. Figure 8 displays the negative effect on the number of terrorist attacks to the federal countries. This effect has not been tested on many occasions in the literature by controlling for socio-economic conditions, the marginal effects presented in figure 8 have significance at 5% and 1% as shown in Appendix A.V. We estimate including this variable as a control and although the negative coefficient is significant at the 1% we wanted to submit, in addition to the estimation, this dummy in interaction with our proposed variable (table 7 presents the results). The aim of this interaction is to assess whether the negative effect of decentralization remains for the federal countries even against the positive effect of the variables on geographical fragmentation and in comparison with zeros in the observations for non-federal countries. The results are consistent in the positive effect for individual variables about geographical fragmentation and negative for this interaction but with a considerably lower coefficient in comparison to the last estimation where federal dummy was introduced as an additional control (seventh estimation).

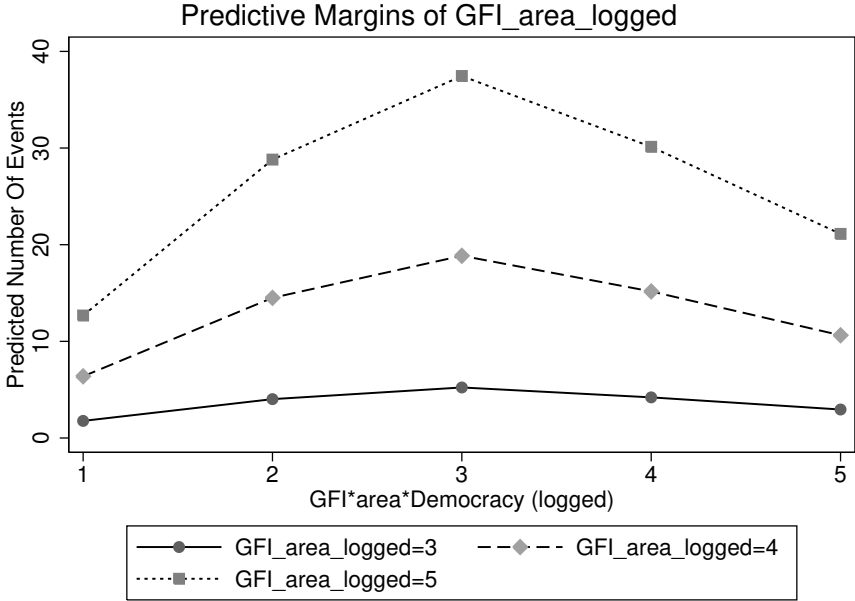
From other perspective, the literature has assessed other types of fragmentation, these are, ethnic, religious and linguistic. It is important to present evidence that the variable implemented for geographical fragmentation is not capturing these other types of fragmentation in the estimates. For this reason, following Alesina et al. (2003) we include the variables that the authors propose to assess these effects. Table 6 presents Spearman's non-parametric correlation taking into account the distributions of these variables. Subsequently, we followed the same methodology presented in section IV.I including these elements and consistent results are founded, in fact the variable of most interest (GFI\*area) is presented with a higher coefficient regarding the number of terrorist attacks across countries in the third estimation where all types of fractionalization are included as is shown in Appendix C.I.

**Table 5:** Robustness check by interacting GFI\*area and level of democracy

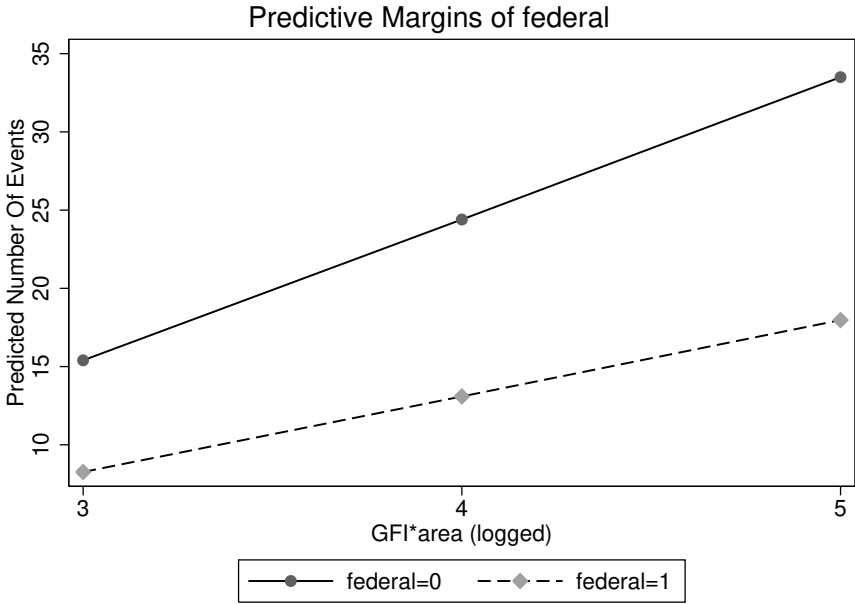
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
Negative binomial						
Real GDP per capita(logged)	5.688*** (0.707)	3.961*** (0.710)	4.287*** (0.670)	5.997*** (0.743)	4.001*** (0.741)	4.361*** (0.695)
Real GDP per capita (sq,logged)	-0.299*** (0.0401)	-0.203*** (0.0410)	-0.223*** (0.0387)	-0.314*** (0.0423)	-0.204*** (0.0429)	-0.226*** (0.0401)
Economic growth	-0.0219*** (0.00630)	-0.0218*** (0.00634)	-0.0149*** (0.00521)	-0.0228*** (0.00641)	-0.0225*** (0.00642)	-0.0156*** (0.00529)
Population(logged)	0.475*** (0.0362)	0.535*** (0.0382)	0.530*** (0.0388)	0.447*** (0.0377)	0.530*** (0.0409)	0.524*** (0.0417)
Consumption(logged)	0.622*** (0.172)	0.317* (0.182)	0.115 (0.178)	0.628*** (0.166)	0.252 (0.175)	0.0575 (0.173)
Investment(logged)	-0.320*** (0.0909)	-0.351*** (0.0978)	-0.260*** (0.0867)	-0.331*** (0.0891)	-0.381*** (0.0973)	-0.284*** (0.0846)
Government size(logged)	0.637*** (0.101)	0.663*** (0.0990)	0.571*** (0.0914)	0.652*** (0.101)	0.659*** (0.0974)	0.558*** (0.0903)
Trade openness(logged)	-0.740*** (0.0696)	-0.692*** (0.0688)	-0.837*** (0.0702)	-0.752*** (0.0723)	-0.706*** (0.0696)	-0.851*** (0.0694)
Regime stability	-0.00817*** (0.00117)	-0.00716*** (0.00126)	-0.00465*** (0.00125)	-0.00912*** (0.00120)	-0.00789*** (0.00130)	-0.00537*** (0.00126)
Civil war	1.609*** (0.123)	1.514*** (0.126)	1.493*** (0.124)	1.659*** (0.125)	1.547*** (0.128)	1.531*** (0.125)
GFI (logged)	0.916*** (0.148)	0.628*** (0.150)	0.589*** (0.141)			
GFI * Area (logged)				0.575*** (0.127)	0.324** (0.134)	0.285** (0.124)
GFI (logged)*Democracy	0.00742** (0.00304)	0.00812** (0.00323)	0.00740*** (0.00267)			
(GFI * Area, logged)*Democracy				0.00481*** (0.00180)	0.00483** (0.00189)	0.00443*** (0.00157)
Constant	-32.53*** (3.088)	-23.77*** (3.035)	-25.19*** (2.861)	-34.02*** (3.165)	-23.39*** (3.142)	-24.92*** (2.927)
Inflate						
Democracy	-0.346*** (0.0255)	-0.380*** (0.0303)	-0.394*** (0.0307)	-0.347*** (0.0257)	-0.383*** (0.0309)	-0.398*** (0.0314)
Constant	-0.0368 (0.193)	-0.0207 (0.207)	-0.109 (0.218)	-0.0775 (0.200)	-0.0501 (0.212)	-0.151 (0.224)
$\alpha$	1.231*** (0.0323)	1.204*** (0.0326)	1.067*** (0.0339)	1.255*** (0.0326)	1.219*** (0.0327)	1.083*** (0.0338)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869

Note: Dependent variable is total terrorist attacks per year.  $\alpha$  indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; \*\*\* p<0.01, \*\*p<0.05, \*p<0.1.

**Figure 7:** Margins plot of terrorist attacks by GFI\*area(logged) in its interaction with democracy throughout all levels of geographic fragmentation



**Figure 8:** Margins plot of terrorist attacks by federalism and GFI\*area (logged)



**Table 6:** Non-parametric correlation between fragmentation variables

Variable	GFI	GFI*area
GFI	1	
GFI*area	0.8531*	1
Ethnic Frac.	-0.0078	0.0808*
Language Frac.	-0.2406*	-0.1301*
Religion Frac.	-0.2368*	-0.2391*

Note: Spearman's correlation implemented. \*  $p < 0.01$ .

**Table 7:** Robustness check by interacting GFI\*area and a dummy for federalism

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	ZINB						
Negative binomial							
Real GDP per capita(logged)	5.027*** (0.733)	3.454*** (0.731)	3.640*** (0.672)	5.320*** (0.769)	3.480*** (0.764)	3.689*** (0.696)	3.699*** (0.696)
Real GDP per capita (sq.logged)	-0.256*** (0.0419)	-0.169*** (0.0424)	-0.180*** (0.0389)	-0.269*** (0.0440)	-0.170*** (0.0444)	-0.182*** (0.0404)	-0.183*** (0.0404)
Economic growth	-0.0222*** (0.00627)	-0.0220*** (0.00631)	-0.0149*** (0.00516)	-0.0231*** (0.00638)	-0.0227*** (0.00640)	-0.0156*** (0.00525)	-0.0156*** (0.00524)
Population(logged)	0.555*** (0.0376)	0.610*** (0.0391)	0.615*** (0.0411)	0.527*** (0.0388)	0.604*** (0.0415)	0.609*** (0.0435)	0.603*** (0.0433)
Consumption(logged)	0.764*** (0.147)	0.442** (0.173)	0.215 (0.171)	0.790*** (0.137)	0.378** (0.167)	0.163 (0.165)	0.159 (0.165)
Investment(logged)	-0.241*** (0.0868)	-0.310*** (0.0963)	-0.227*** (0.0863)	-0.251*** (0.0852)	-0.348*** (0.0956)	-0.257*** (0.0839)	-0.256*** (0.0839)
Government size(logged)	0.647*** (0.0989)	0.678*** (0.0982)	0.575*** (0.0900)	0.661*** (0.0985)	0.673*** (0.0962)	0.561*** (0.0883)	0.553*** (0.0884)
Trade openness(logged)	-0.778*** (0.0685)	-0.714*** (0.0695)	-0.849*** (0.0711)	-0.788*** (0.0709)	-0.727*** (0.0697)	-0.862*** (0.0696)	-0.860*** (0.0696)
Regime stability	-0.00730*** (0.00114)	-0.00709*** (0.00127)	-0.00469*** (0.00121)	-0.00806*** (0.00117)	-0.00773*** (0.00131)	-0.00530*** (0.00123)	-0.00521*** (0.00123)
Civil war	1.541*** (0.117)	1.482*** (0.118)	1.451*** (0.117)	1.583*** (0.120)	1.515*** (0.119)	1.489*** (0.117)	1.493*** (0.117)
GFI (logged)	1.065*** (0.149)	0.762*** (0.155)	0.706*** (0.144)				
GFI * Area (logged)				0.705*** (0.123)	0.422*** (0.136)	0.376*** (0.126)	0.373*** (0.126)
Federal							-0.592*** (0.101)
GFI (logged)*Federal	-0.183*** (0.0275)	-0.151*** (0.0286)	-0.165*** (0.0280)				
(GFI * Area, logged)*Federal				-0.111*** (0.0165)	-0.0899*** (0.0169)	-0.0980*** (0.0165)	
Constant	-31.64*** (3.043)	-23.30*** (3.024)	-23.99*** (2.772)	-33.41*** (3.113)	-22.97*** (3.156)	-23.76*** (2.855)	-23.70*** (2.855)
Inflate							
Democracy	-0.346*** (0.0239)	-0.378*** (0.0285)	-0.392*** (0.0288)	-0.348*** (0.0240)	-0.382*** (0.0289)	-0.395*** (0.0293)	-0.395*** (0.0293)
Constant	0.182 (0.147)	0.181 (0.159)	0.102 (0.170)	0.170 (0.149)	0.161 (0.161)	0.0736 (0.174)	0.0727 (0.174)
$\alpha$	1.185*** (0.0324)	1.168*** (0.0327)	1.027*** (0.0328)	1.207*** (0.0324)	1.183*** (0.0326)	1.043*** (0.0326)	1.044*** (0.0326)
Regional dummies	NO	YES	YES	NO	YES	YES	YES
Time effects	NO	NO	YES	NO	NO	YES	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869	3,869

Note: Dependent variable is total terrorist attacks per year.  $\alpha$  indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

## V. Conclusions

This research makes a contribution to the literature related to the determinants of terrorism by introducing variables such as geographical fragmentation on a background of socio-economic conditions. According to estimates, it succeeds in showing a positive effect of the Geographical Fragmentation Index (GFI) and in its interaction with the national total area (GFI\*area). When analyzing margins associated with both variables it is shown that the interaction between these two presents positive relationship and steadily growing through all levels (statistical significant), margins that are calculated leaving the other variables in their average level. This effect is consistent across the different estimates and robustness checks.

Even the interaction between the proposed variable (GFI) and others of political nature, as the level of democracy and political decentralization, presents statistical significant results that support our hypothesis. Namely, the geographical fragmentation prevents the government's presence throughout the national territory (in line what is presented in [Bandyopadhyay and Younas \(2011\)](#)), which leads to a worsening in the socio-economic conditions and therefore an incentive for terrorist behavior taking into account that their opportunity cost is lower facing a fragile state (in coherence to the findings in [Crenshaw \(1981\)](#), [Krueger and Malečková \(2003\)](#) and [Okafor and Piesse \(2017\)](#)).

Finally, it is important to note that this investigation also serves as a support to what has already been presented by authors such as [Freytag et al. \(2011\)](#), [Hess and Blomberg \(2008\)](#), [Kurrild-Klitgaard et al. \(2006\)](#) and [Lai \(2007\)](#) that have studied the determinants of terrorism from the socio-economic perspective. As well as presented by [Li \(2005b\)](#) and [Kirk \(1983\)](#) on democracy and government size as variables that have a very particular effect in its influence on the terrorist behavior. It is proposed then for future research to develop econometric methods to use these types of models with zero inflated negative binomial distribution for panel-type data and to analyze, using aleatory effects, the robustness of this type of geographical variables controlled by time and region of the different countries affected by terrorist attacks.

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## Appendix

### A. Predictive Margins

**A.I Statistical significance and confidence intervals for margins by level of democracy and GFI\*area (logged)  
(figure 4)**

Level interaction		Margin	Std. Err.	P-value	[95% Conf. Interval]		Level interaction		Margin	Std. Err.	P-value	[95% Conf. Interval]	
Democracy	GFI*area (logged)				Democracy	GFI*area (logged)	Democracy	GFI*area (logged)					
1	3	6,916	3,192	0,030	0,660	13,171	11	4	22,610	4,418	0,000	13,952	31,269
1	4	12,654	2,769	0,000	7,227	18,082	11	5	28,277	2,132	0,000	24,098	32,456
1	5	15,826	1,807	0,000	12,283	19,368	12	3	12,422	5,518	0,024	1,607	23,238
2	3	8,087	3,683	0,028	0,869	15,305	12	4	22,730	4,439	0,000	14,029	31,431
2	4	14,798	3,095	0,000	8,733	20,863	12	5	28,428	2,142	0,000	24,230	32,625
2	5	18,507	1,798	0,000	14,982	22,031	13	3	12,467	5,537	0,024	1,614	23,321
3	3	9,136	4,124	0,027	1,054	17,219	13	4	22,813	4,454	0,000	14,083	31,543
3	4	16,717	3,398	0,000	10,056	23,378	13	5	28,531	2,148	0,000	24,320	32,741
3	5	20,907	1,813	0,000	17,354	24,460	14	3	12,498	5,551	0,024	1,619	23,377
4	3	10,017	4,496	0,026	1,205	18,828	14	4	22,869	4,464	0,000	14,119	31,619
4	4	18,328	3,665	0,000	11,144	25,512	14	5	28,601	2,153	0,000	24,381	32,820
4	5	22,922	1,858	0,000	19,281	26,563	15	3	12,519	5,560	0,024	1,622	23,416
5	3	10,717	4,792	0,025	1,324	20,109	15	4	22,907	4,471	0,000	14,143	31,670
5	4	19,609	3,885	0,000	11,995	27,223	15	5	28,648	2,156	0,000	24,423	32,874
5	5	24,524	1,919	0,000	20,763	28,284	16	3	12,533	5,566	0,024	1,625	23,442
6	3	11,249	5,018	0,025	1,414	21,085	16	4	22,933	4,476	0,000	14,160	31,706
6	4	20,584	4,056	0,000	12,635	28,533	16	5	28,681	2,158	0,000	24,452	32,910
6	5	25,743	1,979	0,000	21,864	29,622	17	3	12,543	5,570	0,024	1,626	23,459
7	3	11,642	5,185	0,025	1,479	21,804	17	4	22,951	4,479	0,000	14,172	31,729
7	4	21,302	4,183	0,000	13,103	29,500	17	5	28,703	2,159	0,000	24,471	32,935
7	5	26,641	2,030	0,000	22,662	30,620	18	3	12,549	5,573	0,024	1,627	23,472
8	3	11,923	5,305	0,025	1,526	22,321	18	4	22,963	4,481	0,000	14,179	31,746
8	4	21,817	4,275	0,000	13,438	30,197	18	5	28,718	2,160	0,000	24,484	32,951
8	5	27,286	2,069	0,000	23,230	31,342	19	3	12,554	5,575	0,024	1,628	23,480
9	3	12,122	5,390	0,025	1,558	22,686	19	4	22,971	4,483	0,000	14,185	31,757
9	4	22,181	4,340	0,000	13,674	30,688	19	5	28,728	2,161	0,000	24,493	32,963
9	5	27,741	2,098	0,000	23,629	31,853	20	3	12,557	5,576	0,024	1,628	23,485
10	3	12,261	5,449	0,024	1,581	22,941	20	4	22,976	4,484	0,000	14,188	31,764
10	4	22,435	4,386	0,000	13,838	31,031	20	5	28,735	2,161	0,000	24,500	32,970
10	5	28,058	2,118	0,000	23,907	32,209	21	3	12,559	5,577	0,024	1,628	23,489
11	3	12,357	5,490	0,024	1,597	23,117	21	4	22,980	4,484	0,000	14,191	31,769
							21	5	28,740	2,161	0,000	24,504	32,975

**A.II Statistical significance and confidence intervals for margins by GFI\*area (logged) and regime stability (figure 5)**

Level interaction		Margin	Std. Err.	P-value	[95% Conf. Interval]	
GFI*area (logged)	Regime stability					
3	1	22,063	10,141	0,030	2,188	41,938
3	2	14,335	6,607	0,030	1,386	27,285
3	3	9,375	4,281	0,029	0,984	17,765
3	4	8,801	3,891	0,024	1,175	16,428
3	5	8,493	3,810	0,026	1,025	15,960
4	1	40,371	8,532	0,000	23,649	57,093
4	2	26,231	5,617	0,000	15,221	37,240
4	3	17,154	3,793	0,000	9,719	24,588
4	4	16,105	3,444	0,000	9,355	22,855
4	5	15,539	3,276	0,000	9,118	21,961
5	1	50,490	5,497	0,000	39,716	61,263
5	2	32,805	4,113	0,000	24,744	40,866
5	3	21,453	2,347	0,000	16,854	26,052
5	4	20,141	2,397	0,000	15,444	24,839
5	5	19,434	2,109	0,000	15,300	23,568

**A.III Statistical significance and confidence intervals for margins by GFI\*area (logged) and civil war (figure 6)**

Level interaction		Margin	Std. Err.	P-value	[95% Conf. Interval]	
GFI*area (logged)	Civil war					
3	0	10,039	4,473	0,025	1,273	18,805
3	1	40,857	18,813	0,030	3,985	77,729
4	0	18,369	3,642	0,000	11,231	25,507
4	1	74,760	16,052	0,000	43,298	106,221
5	0	22,973	1,885	0,000	19,279	26,667
5	1	93,498	10,638	0,000	72,648	114,348

**A.IV Statistical significance and confidence intervals for margins by  
(GFI\*area,logged)\*democracy through all levels of (GFI\*area,logged)  
(figure 7)**

Level interaction		Margin	Std. Err.	P-value	[95% Conf. Interval]	
Democracy* (GFI*area,logged)	GFI*area (logged)					
1	3	1,769	0,879	0,044	0,046	3,492
1	4	6,380	1,687	0,000	3,074	9,686
1	5	12,674	2,093	0,000	8,573	16,776
2	3	4,021	2,015	0,046	0,072	7,969
2	4	14,501	3,553	0,000	7,538	21,464
2	5	28,806	5,627	0,000	17,778	39,834
3	3	5,228	2,295	0,023	0,731	9,725
3	4	18,855	4,851	0,000	9,348	28,363
3	5	37,457	6,473	0,000	24,770	50,144
4	3	4,205	2,034	0,039	0,219	8,191
4	4	15,165	3,523	0,000	8,260	22,070
4	5	30,127	4,000	0,000	22,286	37,967
5	3	2,948	1,388	0,034	0,228	5,667
5	4	10,631	2,583	0,000	5,569	15,692
5	5	21,118	1,620	0,000	17,943	24,294

**A.V Statistical significance and confidence intervals for margins by GFI\*area  
(logged) and a dummy for federalism (figure 8)**

Level interaction		Margin	Std. Err.	P-value	[95% Conf. Interval]	
GFI*area (logged)	Federalism					
3	1	15,402	6,844	0,024	1,987	28,816
3	0	8,264	3,655	0,024	1,100	15,428
4	1	24,400	4,953	0,000	14,693	34,107
4	0	13,093	2,906	0,000	7,398	18,788
5	1	33,498	3,048	0,000	27,523	39,472
5	0	17,974	1,569	0,000	14,899	21,049

## A.VI List of countries

Afghanistan	Croatia	Israel	Namibia	Sri Lanka
Albania	Cuba	Italy	Nepal	Sudan
Algeria	Czech Republic	Ivory Coast	Netherlands	Sweden
Angola	Denmark	Jamaica	New Zealand	Switzerland
Argentina	Dominican Republic	Japan	Nicaragua	Syria
Australia	Ecuador	Jordan	Niger	Tajikistan
Austria	Egypt	Kazakhstan	Nigeria	Tanzania
Azerbaijan	El Salvador	Kenya	Norway	Thailand
Bangladesh	Estonia	Kuwait	Pakistan	Togo
Belarus	Ethiopia	Kyrgyzstan	Panama	Trinidad and Tobago
Belgium	France	Laos	Papua New Guinea	Tunisia
Benin	Georgia	Latvia	Paraguay	Turkey
Bolivia	Germany	Lebanon	Peru	Uganda
Botswana	Ghana	Lesotho	Philippines	Ukraine
Brazil	Greece	Liberia	Poland	United Arab Emirates
Bulgaria	Guatemala	Libya	Portugal	United Kingdom
Burundi	Guinea	Lithuania	Russia	United States
Cambodia	Guinea-Bissau	Macedonia	Rwanda	Uruguay
Cameroon	Haiti	Madagascar	Saudi Arabia	Uzbekistan
Canada	Honduras	Malaysia	Senegal	Venezuela
Central African Republic	Hungary	Mali	Sierra Leone	Vietnam
Chad	India	Mauritania	Singapore	Yemen
Chile	Indonesia	Mexico	Slovenia	Zambia
China	Iran	Moldova	Somalia	Zimbabwe
Colombia	Iraq	Morocco	South Africa	
Costa Rica	Ireland	Mozambique	Spain	

## B. Overdispersion and zero-inflated evidence

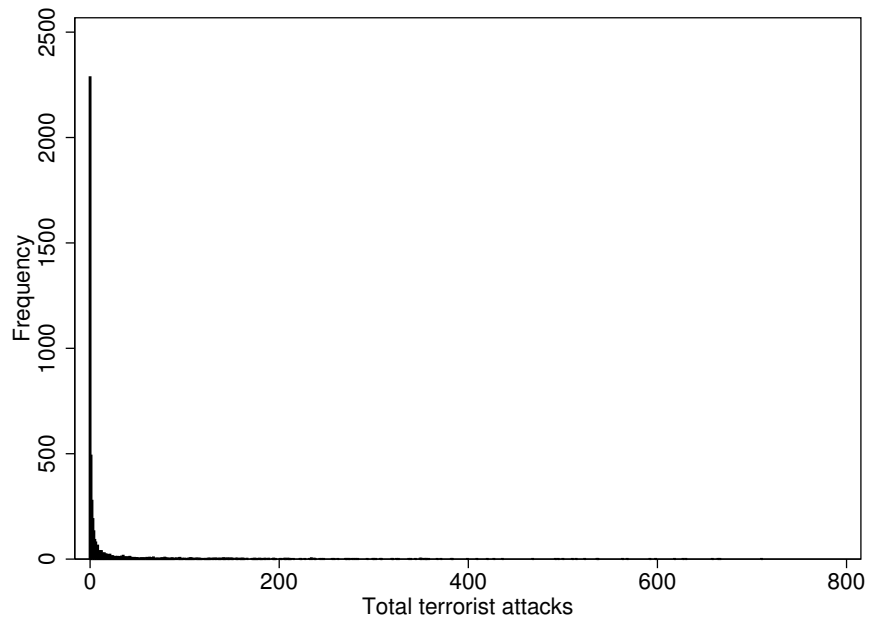
### B.I Overdispersion evidence

Democracy	Mean	Variance	N
-10	1.4069	12.826	145
-9	2.6591	59.789	308
-8	1.4648	38.033	213
-7	3.0461	358.8	846
-6	13.253	2229.8	241
-5	23.506	4123.7	81
-4	11.244	1536.3	78
-3	23.551	3886.6	98
-2	8.5878	3874.7	131
-1	15.869	2628.1	99
0	24.074	5146.2	121
1	15	564.13	49
2	19.133	6573	45
3	17.741	721.77	58
4	15.438	2237.4	121
5	20.394	3630.1	155
6	23.23	3299.7	248
7	48.549	16867	164
8	43.197	9348.9	325
9	31.011	5533.3	263
10	15.59	1853.8	842
Total	16.088	3164	4631

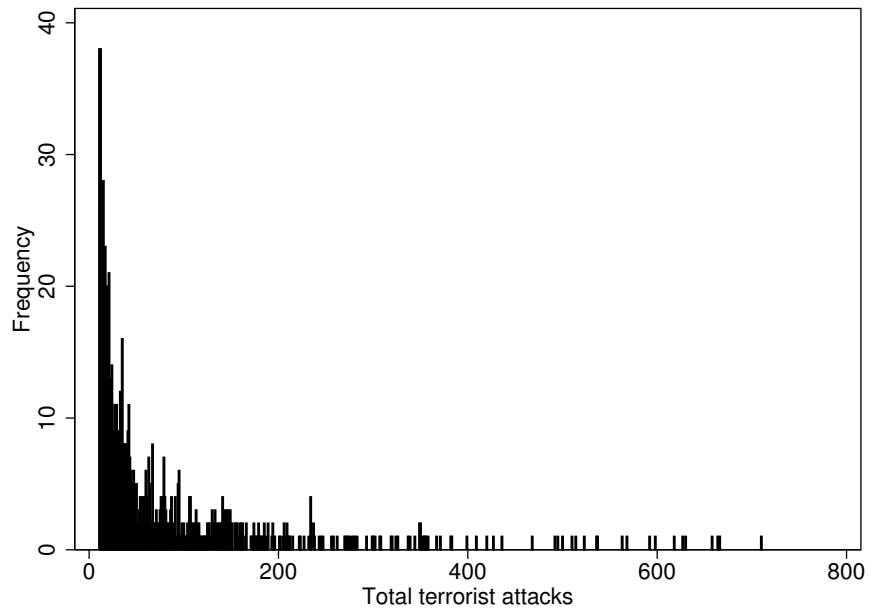


## B.II Zero-inflated evidence

**Figure 9:** Histogram for the total number of terrorist attacks



**Figure 10:** Histogram for the number of terrorist attacks (greater than 10 attacks)



## C. Robustness checks

### C.I Different fractionalization types

VARIABLES	(1)	(2)	(3)	(4)
	ZINB			
	Negative binomial			
Real GDP per capita(logged)	4.338*** (0.731)	4.236*** (0.697)	4.257*** (0.721)	4.053*** (0.702)
Real GDP per capita (sq,logged)	-0.222*** (0.0423)	-0.218*** (0.0405)	-0.221*** (0.0416)	-0.208*** (0.0406)
Economic growth	-0.0185*** (0.00525)	-0.0186*** (0.00488)	-0.0184*** (0.00515)	-0.0183*** (0.00482)
Population(logged)	0.559*** (0.0430)	0.567*** (0.0436)	0.540*** (0.0427)	0.548*** (0.0463)
Consumption(logged)	0.214 (0.161)	0.0852 (0.174)	0.110 (0.173)	0.146 (0.169)
Investment(logged)	-0.313*** (0.0829)	-0.279*** (0.0861)	-0.253*** (0.0838)	-0.334*** (0.0836)
Government size(logged)	0.638*** (0.0900)	0.679*** (0.0888)	0.581*** (0.0892)	0.701*** (0.0917)
Trade openness(logged)	-0.838*** (0.0739)	-0.827*** (0.0704)	-0.876*** (0.0705)	-0.830*** (0.0780)
Regime stability	-0.00492*** (0.00128)	-0.00452*** (0.00128)	-0.00471*** (0.00128)	-0.00348*** (0.00130)
Civil war	1.581*** (0.121)	1.367*** (0.130)	1.574*** (0.120)	1.396*** (0.125)
GFI * Area (logged)	0.261** (0.128)	0.430*** (0.128)	0.358*** (0.125)	0.416*** (0.137)
Religion Frac. (logged)	-0.0682* (0.0413)			-0.0858* (0.0487)
Language Frac. (logged)		0.0270 (0.0336)		0.105** (0.0474)
Ethnic Frac. (logged)			-0.179** (0.0696)	-0.170** (0.0804)
Constant	-25.64*** (3.006)	-26.14*** (2.852)	-24.43*** (3.052)	-24.65*** (2.971)
	Inflate			
Democracy	-0.376*** (0.0274)	-0.368*** (0.0286)	-0.375*** (0.0278)	-0.366*** (0.0287)
Constant	-0.0486 (0.190)	-0.236 (0.215)	-0.0754 (0.191)	-0.256 (0.216)
$\alpha$	1.062*** (0.0333)	1.047*** (0.0339)	1.069*** (0.0333)	1.051*** (0.0335)
Regional dummies	YES	YES	YES	YES
Time effects	YES	YES	YES	YES
Observations	3,773	3,630	3,757	3,614

Note: Dependent variable is total terrorist attacks per year.  $\alpha$  indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; \*\*\*

p<0.01, \*\*p<0.05, \*p<0.1.

**C.II Robustness checks for zero-inflated negative binomial estimations  
(clustered variance by year)**

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	ZINB					
	Negative binomial					
Real GDP per capita(logged)	5.626*** (0.941)	3.918*** (0.840)	4.483*** (0.927)	5.957*** (0.970)	3.952*** (0.856)	4.405*** (0.868)
Real GDP per capita (sq,logged)	-0.292*** (0.0515)	-0.199*** (0.0478)	-0.231*** (0.0514)	-0.308*** (0.0531)	-0.200*** (0.0487)	-0.227*** (0.0477)
Economic growth	-0.0220*** (0.00550)	-0.0218*** (0.00557)	-0.0225*** (0.00566)	-0.0229*** (0.00569)	-0.0225*** (0.00576)	-0.0159*** (0.00549)
Population(logged)	0.497*** (0.0467)	0.557*** (0.0451)	0.508*** (0.0376)	0.470*** (0.0474)	0.553*** (0.0461)	0.538*** (0.0360)
Consumption(logged)	0.770*** (0.161)	0.417** (0.171)	0.474** (0.198)	0.787*** (0.149)	0.342** (0.165)	0.147 (0.191)
Investment(logged)	-0.270*** (0.0914)	-0.319*** (0.101)	-0.302*** (0.0946)	-0.277*** (0.0909)	-0.354*** (0.100)	-0.265** (0.105)
Government size(logged)	0.680*** (0.117)	0.707*** (0.121)	0.701*** (0.118)	0.698*** (0.119)	0.702*** (0.122)	0.594*** (0.115)
Trade openness(logged)	-0.765*** (0.0727)	-0.712*** (0.0987)	-0.809*** (0.0756)	-0.781*** (0.0733)	-0.728*** (0.0972)	-0.875*** (0.0653)
Regime stability	-0.00763*** (0.000871)	-0.00677*** (0.000890)	-0.00643*** (0.000903)	-0.00849*** (0.000921)	-0.00749*** (0.000935)	-0.00486*** (0.00140)
Civil war	1.574*** (0.112)	1.485*** (0.107)	1.500*** (0.114)	1.621*** (0.113)	1.517*** (0.107)	1.501*** (0.111)
GFI (logged)	1.024*** (0.112)	0.728*** (0.133)	0.690*** (0.153)			
GFI * Area (logged)				0.645*** (0.0998)	0.380*** (0.129)	0.329** (0.128)
Constant	-33.53*** (4.139)	-24.50*** (3.392)	-66.14* (39.65)	-35.21*** (4.229)	-24.03*** (3.517)	-25.84*** (4.060)
	Inflate					
Democracy	-0.348*** (0.0237)	-0.381*** (0.0256)	-0.382*** (0.0265)	-0.350*** (0.0240)	-0.385*** (0.0266)	-0.398*** (0.0285)
Constant	-3.344*** (0.225)	-3.648*** (0.239)	-3.786*** (0.234)	-3.375*** (0.226)	-3.706*** (0.246)	-3.952*** (0.265)
$\alpha$	1.211*** (0.0675)	1.184*** (0.0670)	1.195*** (0.0678)	1.233*** (0.0664)	1.200*** (0.0658)	1.066*** (0.0575)
Regional dummies	NO	YES	YES	NO	YES	YES
Time effects	NO	NO	YES	NO	NO	YES
Observations	4,074	3,869	3,869	4,074	3,869	3,869

Note: Dependent variable is total terrorist attacks per year.  $\alpha$  indicates the overdispersion parameter of the negative binomial type II distribution. Robust and cluster standard errors in parentheses; \*\*\* p<0.01, \*\*p<0.05, \*p<0.1.