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Eric Neumayer[a] and Thomas Plümper[b]

[a] Department of Geography and Environment, London School of Economics and Political Science (LSE), London WC2A 2AE, UK and Centre for the Study of Civil War, International Peace Research Institute Oslo (PRIO), e.neumayer@lse.ac.uk

[b] Department of Government, University of Essex, Wivenhoe Park, Colchester CO4 3SQ, UK, and Centre for the Study of Civil War, International Peace Research Institute Oslo (PRIO), tpluem@essex.ac.uk

Abstract

If terror attacks from groups of one country are followed by similar attacks on the same target from groups of other similar countries, then this could be the consequence of contagion. However, just because one terror incident follows another does not necessarily imply that the former is caused by the latter or, in other words, that terror attacks are what is called spatially dependent. Rather, both incidents could have been triggered by the same underlying cause. This is known as Galton's problem. One area where this problem is particularly prevalent is international terrorism. According to Huntington, international terrorism is contagious because of civilizational rallying effects. If radical groups from one country attack targets from a country of another civilization, then groups from other countries of the same civilization as the initial terrorist groups will become more likely to also attack this target. Any test of this hypothesis has to solve Galton's problem and thus to disentangle spatial dependence from spatial clustering of attacks and common shocks and trends, which affect similar groups from different countries similarly. Accounting for such potentially confounding effects, we nevertheless find evidence for spatial dependence in international terrorism along civilizational lines in the post-Cold War period and particularly so for specific inter-civilizational combinations. However, while contagion consistent with Huntington's predictions exists, spatial dependence seems to have a substantively small effect on patterns of international terrorism.

1. Introduction

Terrorist attacks are unlikely to be independent of each other (Midlarsky et al. 1980; Hamilton and Hamilton 1983; Drakos and Gofas 2006; Braithwaite and Li 2007). If a terrorist group conducts a successful terrorist attack, it will more likely attempt to launch similar attacks in the future. Single groups thus often conduct what is known as 'terror campaigns', which leads to temporal dependence in attacks. Similarly, different groups pursue similar goals or compete with each other for attention and support.[1] As a consequence, they are likely to choose similar strategies. Again, terrorist attacks are contagious, this time leading to spatial dependence.

While terrorism can thus be contagious for very different reasons, Samuel Huntington (1996) has suggested the arguably most prominent explanation for spatial dependence in international terrorism. According to Huntington (1993a, 1993b, 1996), *civilizational rallying effects* draw individuals and extremist groups from different countries but the same civilization into conducting attacks on targets from a country of another civilization if other groups from the same civilization attack victims from this country. If this holds, then a terrorist attack from a, say, Pakistani group on British targets should increase the probability of other Islamic groups also attacking British targets.

Yet, researchers must be careful in interpreting spatially related terrorist attacks from similar groups on the same target as evidence for implicit coalition formation between terrorist groups. In fact, similar terrorist attacks could also be caused by an increase in competition between terrorist groups which compete for scarce support and attention. This would also lead to spatial dependence in terrorist attacks, but for very different reasons than rallying. Likewise, spatial clustering may also occur when groups face similar underlying incentives. In this case, terrorist groups may act perfectly independent from each other, but

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[1] Elsewhere, we discussed this logic in greater detail. See Plümper and Neumayer (2010b) and Neumayer and Plümper (2010a).

researchers could erroneously interpret their findings as evidence for spatial dependence. Clearly, if one individual opens an umbrella after another has already done so, the reason is unlikely to be any contagious effect in the use of umbrellas but simply the fact that it rains. Likewise, if two terror groups conduct similar attacks they may well respond to the same incentives for doing so rather than trying to support each other. If terrorist groups spatially depend on each other, then one group attacks a particular target because another group has already attacked the same target. If, however, spatial patterns result from spatial clustering or common shocks and trends, then two similar groups attack the same target because they are independently stimulated by the same incentive structure or change in incentive structure.

Social scientists know the apparent observational similarity between the consequences of common trends and shocks as well as spatial clustering on the one hand and the consequences of spatial dependency on the other as Galton's (1889) problem. If either spatial clustering or common shocks and trends are not adequately modeled, then an analysis might spuriously suggest spatial dependence. In other words, the challenge is to identify the true spatial dependence effect. Identification rests on the assumption that all the spatial pattern of the dependent variable that has nothing to do with spatial dependence itself is fully explained by the independent variables other than the spatial lag. This is a strong assumption and if it does not hold then the estimated coefficients for the variables capturing the spatial dependence effects are likely to be biased.

In this paper, we use model specification techniques for the analysis of spatial dependence, which we have discussed in greater detail elsewhere (Plümper and Neumayer 2010a), to separate spatial dependence from spatial clustering and common shocks and trends. As a first step, we include civilization dyad-specific dummy variables into our analysis to control for spatial clustering in the levels of international terrorism. Put simply, these controls account for the fact that some civilizational combinations have a higher a priori propensity to experience international terrorism even after controlling for the confounding variables and in

the absence of any spatial spillover effects. We will then, additionally, include civilization dyad-specific time trends to control for spatial clustering in the changes of international terrorism. These account for the fact that some civilizational combinations are more prone to experience increases or decreases in international terrorism over time. All specifications include year-specific time dummy variables to account for changes in terror propensity over time common to all dyads. All models also include time-varying variables capturing the general terror propensity of both potential terror and potential target countries.

We conduct two types of analyses: first, we try to identify general inter-civilizational rallying effects, distinguishing between the Cold War and the post-Cold War period. According to Huntington, a rallying effect occurs in the latter but not in the former period. And second, we focus on three inter-civilizational combinations, which Huntington identifies as particularly prone to international terrorism, namely the clashes between non-Western and the Western civilizations, between the Islamic and non-Islamic civilizations and, particularly, between the Islamic and the Western civilizations.

Our results provide support for the general rallying hypothesis in the post-Cold War period. The more stringent we control for confounding factors, the smaller the estimated coefficient of the spatial lag variable capturing the civilizational rallying effect becomes, but it remains statistically significant throughout. If, additionally, we condition the spatial lag variables on the three inter-civilizational combinations identified by Huntington, then we also find evidence suggesting the existence of rallying effects in the post-Cold War period. However, in substantive terms these spatial spillover effects are relatively modest. While existent, they therefore do not seem to play an important role in determining patterns of international terrorism.

Our paper contributes to two important, yet separate literatures. First, we contribute to the rapidly growing literature on international terrorism by analyzing whether international terrorist events are contagious along civilizational lines. Second, we also show the importance

of correctly identifying spatial dependence by accounting for spatial clustering, common shocks and common trends. Our analysis demonstrates how failure to control for confounding factors leads to an overestimation of spatial dependence. While our analysis is on patterns of international terrorism, it is likely to have relevance in many other areas of social science research as well.

2. Civilizational Rallying and International Terrorism

At first glance, data on international terrorist incidents seemingly lend support to the potential existence of civilizational rallying effects. Table 1 lists the number of terror incidents for each year from 1968 to 2005, together with a breakdown into terror incidents that are intra-civilizational (terrorists and victims belong to the same civilization) and inter-civilizational (terrorists and victims belong to different civilizations). Interestingly, a large share and in many years even the majority of international terrorism is inter-civilizational. Also, the share of inter-civilizational terror incidents seems to have increased after the end of the Cold War. Data reported in Neumayer and Plümper (2009, tables 2 and 3) show that Westerners are the main target of inter-civilizational terrorism in general as well as of Islamic terrorists in particular and that the Islamic civilization is the most prone to inter-civilizational terrorism.

Table 1. Total and inter-civilizational terror incidents over time (1968 to 2005).

year	total incidents	intra-civilizational	inter-civililzational	share inter-civilizational
1968	59	25	34	57.63
1969	54	18	36	66.67
1970	126	41	85	67.46
1971	98	36	62	63.27
1972	107	41	66	61.68
1973	171	111	60	35.09
1974	197	109	88	44.67
1975	176	91	85	48.30
1976	194	120	74	38.14
1977	186	109	77	41.40
1978	128	73	55	42.97
1979	180	105	75	41.67
1980	269	151	118	43.87
1981	258	129	129	50.00
1982	222	123	99	44.59
1983	240	111	129	53.75
1984	258	128	130	50.39
1985	281	159	122	43.42
1986	258	123	135	52.33
1987	274	167	107	39.05
1988	206	111	95	46.12
1989	160	75	85	53.13
1990	234	120	114	48.72
1991	315	162	153	48.57
1992	194	109	85	43.81
1993	223	90	133	59.64
1994	216	76	140	64.81
1995	151	46	105	69.54
1996	134	50	84	62.69
1997	113	49	64	56.64
1998	45	10	35	77.78
1999	211	31	180	85.31
2000	117	45	72	61.54
2001	30	8	22	73.33
2002	79	17	62	78.48
2003	102	17	85	83.33
2004	93	30	63	67.74
2005	62	29	33	53.23

Source: Own computations from *Iterate*.

One possible explanation for the rapid increase in inter-civilizational terrorism has been put forward by Samuel Huntington. Based on his broader argument that individuals, groups, and governments primarily identify themselves and are identified by others as belonging to a particular civilization, he argues that the conflict between a terrorist group from one

civilization and countries from another civilization draws in other groups from the same civilization as the terrorists. Huntington (1993a: 38) accepts that "civilization rallying to date has been limited", but he maintains that "it has been growing, and it clearly has the potential to spread much further."

While Huntington argues that after the end of the Cold War "the principal conflicts of global politics will occur between nations and groups of different civilizations" (Huntington 1993a: 22), i.e. by the clash of civilizations, he is not very clear on what exactly he means by the term clash (Bassin 2007). Apparently, many forms of violent conflict are subsumed under the umbrella notion of clash. Importantly from the perspective of this article, Huntington regards terrorism as one important form of clash, used particularly by the weaker side in inter-civilizational clashes: "terrorism historically is the weapon of the weak" (Huntington 1996: 187). He makes specific predictions about the relative propensity of civilizations to use terrorism in their conflict with other civilizations. Specifically, he suggests the excessive use of terrorism in the conflict between non-Western civilizations and the West, between the Islamic and non-Islamic civilizations and, particularly, between Islam and the West (Huntington 1996: 188, 263ff.; Huntington 2002). To do justice to Huntington's paradigm, in this article we will test the two hypotheses that after the end of the Cold War international terrorism is contagious along civilizational lines in general as well as that it is contagious for the specific inter-civilizational combinations identified by Huntington as most prone to the use of this particular form of conflict.

3. Variables, Estimation Technique and Sample

In this section, we describe the dependent and control variables. In the following section, we will discuss in some detail the model specification techniques that allow us to deal with Galton's problem by disentangling spatial dependence from spatial clustering, common shocks and common time trends.

Dependent Variable

Our source for data on international terrorism is the "International Terrorism: Attributes of Terrorist Events" (*Iterate*) dataset (Mickolus et al. 2003). It defines terror as "the use, or threat of use, of anxiety-inducing, extra-normal violence for political purposes by any individual or group, whether acting for or in opposition to established governmental authority, when such action is intended to influence the attitudes and behaviour of a target group wider than the immediate victims" (ibid.: 2). Acts of terror include, among others, assassinations, bombings and armed attacks, arson and fire, kidnapping, and skyjacking, unless they are acts of ordinary crime or the violence is for purposes other than political (e.g., for drug trafficking purposes), and unless the violence is committed during international and civil wars. Attacks by guerrilla groups are only included if they inflict damage on civilian targets or the dependents of military personnel (Mickolus, Sandler and Murdock 1989: xii). *Iterate* is a very comprehensive database that codes, amongst others, the nationality of both terrorists and the victims of their attacks. The unit of observation in our sample is the directed country dyad year and our dependent variable is the annual sum of terrorist incidents originating from a specific country on targets from another specific country. It does not matter where the act of terrorism took place, whether in the terrorists', victims' or a third country.

To be on the conservative side, we do not include terrorism committed by "Indeterminate Arabs, Palestine", since we cannot allocate these to a specific country. Our results are, however, robust to allocating each of these terror attacks to a randomly drawn Arab country. Using nationality to determine the civilizational belonging of terrorists and victims can, at times, be misleading. In the 7/7 attacks on the London Underground system, for example, the terrorists were Muslims with British citizenship, which would fail to be included as inter-civilizational terrorism, even though it may qualify as such given the apparent Islamist and anti-Western motivations of the terrorists. Such measurement error is likely to bias the results

against finding evidence for Huntington's predictions. However, our test for changes in spillover effects after the end of the Cold War is likely to be affected less, unless such apparent measurement error has become stronger during the post-Cold War period. We exclude terror attacks on Israeli targets or perpetrated by Israeli terrorists. This is because, first, Israel is one of those cases in which it is not clear how Huntington classifies the civilizational belonging.[2] Second, the conflict between Israel and the Palestinians as well as Arab nations is very peculiar and its inclusion would risk biasing our results. Our results are, however, fully robust to including attacks from Israeli terrorists and attacks on Israeli targets.

Control Variables

As structural determinants of international terrorism we include the log of per capita income, the level of democracy and the logged population size of both the terrorists' origin country and the victims' target country. This follows arguments provided by Krueger and Laitin (2008) and Abadie (2006) on welfare and terrorism. Richer country targets are strategically more attractive to terrorists, not least because such attacks generate greater media attention. Poorer countries may generate more terrorism, even though the link between per capita income and a country's propensity to generate terrorist attacks is controversial. Democracies are said to suffer more from terrorism (Li 2005; Enders and Sandler 2006; Kydd and Walter 2006), but the link between regime type in the terrorists' home country and international terrorism is again somewhat controversial (Li 2005). We also control for the population size of both countries to account for the simple fact that *ceteris paribus* more populous countries will generate more terrorism and suffer more from terrorism. Data on income and population are taken from World Bank (2006), data on democracy from the Polity IV project

[2] In Russett, Oneal and Cox's (2000) classification Israel is part of the West, whereas in Henderson and Tucker's (2001) classification it is not part of the Western or any other civilization.

(http://www.cidcm.umd.edu/polity/). Lastly, we control for the fact that contiguity of two countries as well as geographical proximity lowers the costs for terrorists to execute terror acts against foreign nationals. The natural log of the distance between the capital cities of two countries and a dummy variable for contiguity by land or separation by sea of less than 150 miles are taken from www.eugenesoftware.org.

One final complication that comes with the *Iterate* dataset is that it contains incidents in which the main nationality of the terrorists and the victims are the same. These nevertheless do not represent purely domestic terrorism because some other aspect of the incident or its resolution transcends national boundaries and makes these incidents international, which is why they are included in *Iterate*. However, these are cases in which the distinction between international and domestic terrorism is somewhat blurred, which may amount to some form of measurement error. In the main estimations shown below, we control for this potential error by including a dummy variable that is set to one for all incidents in which the main nationality of the terrorists and their targets are the same. Our results are fully robust to not including such a dummy variable as well as robust to excluding all such incidents from the sample. In other words, this apparent source of bias does not have a significant effect on our results.

Estimation technique and sample

Our dependent variable is a count variable (number of terrorist incidents). To account for over-dispersion, which is very prominent in the data, we use a negative binomial model, which is more reliable than the Poisson model for this kind of data. We employ standard errors adjusted for clustering on country dyads. Our sample covers annual observations over the period 1970 to 2005 and up to 150 countries, which form what is called directed country dyads with each other such that each country is linked to each other country once as a potential home country of terrorists and once as a potential target country. Due to missing

data on the explanatory variables not all possible country dyads are included over the entire period.

The dependent variable has a large number of zeros. In such situations, researchers sometimes employ an estimation model known as the zero-inflated negative binomial model or an alternative model known as a hurdle model. Both models rest on problematic assumptions, however. The hurdle model combines a binary model to predict values of zero with another, usually zero-truncated Poisson or zero-truncated negative binomial, model to predict non-zero values. Its underlying assumption is that different mechanisms account for zeros than for the distribution of non-zeros (Hilbe 2007). We doubt whether this estimation procedure is consistent with the underlying data generating process of international terrorism. The zero-inflated negative binomial model assumes that some dyad years do not experience international terrorism with probability of one (Long and Freese 2006) – which seems to be inconsistent with empirical evidence and for which there is no obvious theoretical justification either.

The inclusion of spatial lag variables necessarily introduces some endogeneity bias. The same is true for variables controlling for the terror propensity of terror and target countries, which we include for reasons to be explained in the following section. Lagging the variables by one period can only very partially address the bias (our results are fully robust to lagging these variables by one period). Fortunately, the endogeneity bias is likely to be small. Hays and Franzese (2009) suggest that using an estimation model in which $\ln(y+1)$ rather than y itself enters the spatial effect variable performs well in terms of bias and root mean squared error. They demonstrate this result for Monte Carlo simulations using a Poisson estimator, but the results should carry over to the negative binomial case. We therefore use $\ln(y+1)$ in the generation of the spatial effect and the terror propensity variables.

4. Disentangling Spatial Dependence from Spatial Clustering and Common Trends and Shocks

In spatial econometrics, model specification is arguably even more important than in many other analyses. Failure to control for, for example, common shocks and trends in the data generating process has more severe consequences in spatial than in standard panel data analysis since it directly affects the estimated coefficient for the spatial lag. Such failure will typically cause largely biased coefficients of the spatial lag variables and can lead to wrong inferences. In this section, we explain model specification techniques that allow us to account for Galton's problem.

The Spatial Lag Variable

In order to model spatial dependence, one needs to construct what is known as a spatial lag variable. Such a variable consists of the dependent variable in other country dyads weighted by some weighting or connectivity matrix (Anselin 1988). In our case, the spatial lag variable consists of the amount of terrorism in other dyads formed by the same specific target country with other (potential) terrorist home countries, but only if the terrorist source countries of the other dyads belong to the same civilization as the source country in the country dyad under observation, while the terror and the target country belong to different civilizations. In other words, the connectivity or weighting matrix measures the civilizational belonging of the terrorist and target countries and is set to one if, simultaneously, the terrorist countries share the same civilization, but a different civilization from the target country, and zero otherwise. Instead of merely counting current terror incidents in other countries, we use the sum of terror incidents of the current and prior two years for the creation of the spatial lag variable. The reason is that contagion may take some time as groups need to prepare terror attacks.

Formally, let *i* stand for the source country of the (potential) terrorists and *j* for the target country of the (potential) victims. The *'civilizational rallying'* variable represents what we

have dubbed *specific source contagion* elsewhere.[3] It is the sum of all terror incidents in the current and prior two years from all countries of the same civilization to which country *i* belongs (minus terrorism of the specific country *i* that forms the dyadic unit of observation with country *j*) on targets of the specific country *j* under observation, which is from another civilization than *i*. Ignoring other control variables for the moment and keeping in mind that, following Hays and Franzese (2009), we use ln(*y*+1) rather than *y* itself in the creation of the spatial lag variable, this can be expressed as:

$$y_{ijt} = \beta_1 \sum_{k \neq i} w_{ik} \ln\left(\sum_{m=t-2}^{t} y_{kjm} + 1\right) + \ldots + \varepsilon_{ijt} \quad (1)$$

where y_{ijt} is the number of terror attacks from terrorists of country *i* on targets from country *j* in year *t*. $\sum_{k \neq i} w_{ik} \ln\left(\sum_{m=t-2}^{t} y_{kjm} + 1\right)$ is the spatial lag variable that consists of two elements: a weighting matrix, symbolized by w_{ik}, which is multiplied by the spillover or "spatial y" variable, symbolized by $\ln\left(\sum_{m=t-2}^{t} y_{kjm} + 1\right)$. The "spatial y" is the natural log of one plus the sum of terror attacks by individuals from countries other than country *i*, called countries *k*, on targets from the same target country *j* in this year and the prior two years. The weighting matrix is set to one if, at the same time, country *i* and countries *k* belong to the same civilization and country *j* belongs to a different civilization, and zero otherwise. β_1 is the estimated coefficient of the spatial lag variable, the dots stand for control variables and ε_{ijt} is an error term. A positive β_1 that is statistically significantly different from zero would suggest that terrorism by terrorists from country *i* on targets from country *j* of a different civilization

[3] See Neumayer and Plümper (2010b) for a classification and discussion of all possible forms of modeling spatial dependence in dyadic data.

rises with higher terrorism by terrorists from other countries *k* of the same civilization as country *i* on targets of the same country *j*. For example, if terrorists from other Latin American countries attack US citizens, then this might raise terrorism from Colombian terrorists on US citizens.

To create this spatial lag variable we need information on the civilizational belonging of countries and their correct classification is clearly of great importance. Defining civilizations as "the highest cultural grouping of people and the broadest level of cultural identity people have", being "differentiated from each other by history, language, culture, tradition, and, most important, religion" (ibid.: 25), Huntington identifies seven, or possibly eight, civilizations – Western, Sinic, Japanese, Islamic, Hindu, Slavic-Orthodox, Latin American and, possibly, African. Unfortunately, he does not provide a clear list of the civilizational belonging of countries in his work. Information has to be gathered indirectly from a map of countries of the world, in which he has drawn civilizational information. This does not provide unambiguous information and critics have also noted that he is not entirely consistent in his verbal descriptions on which country belongs to which civilization (Russett, Oneal and Cox's 2000; Henderson and Tucker 2001). We use Russett, Oneal and Cox's (2000) classification, but our results are robust to using Henderson and Tucker's (2001) classification instead.

Modeling Spatial Clustering

Spatial patterns in international terrorism do not need to be caused by spatial dependence. Instead, these patterns can be caused by spatial correlation in other factors influencing or stimulating the dependent variable. Observable as well as unobservable phenomena such as contiguity and geographical distance, political cultures and customs, preferences and perceptions, constitutions and institutions, and so on are typically spatially clustered, which

can lead to spatial patterns in the dependent variable even in the absence of spatial dependence.[4]

A popular method for mitigating the problem created by spatial clustering is the inclusion of fixed effects. Such models take out all of the between variation in the data and are estimated based on the within variation of the data in each observational unit only. This reduces bias because any spatial clustering or unobserved spatial heterogeneity in terrorism *levels* are fully captured by the fixed effects. However, the inclusion of fixed effects not only makes the estimates less efficient (Plümper et al. 2005; Plümper and Troeger 2007), spatial clustering in *changes* in the level of terrorism may also still bias the estimates of the spatial lag and calls for the modeling of common shocks and common trends (Plümper and Neumayer 2010a), to which we turn further below.

To account for spatial clustering in inter-civilizational patterns of international terrorism, we include civilization dyad-specific dummy variables into the estimation model. These account for the fact that some pairs of civilizations are simply more prone to experience international terrorism even in the absence of any civilizational rallying effects. They also appropriately account for spatially clustered incentive structures common to inter-civilizational combinations. In comparison, country dyad-specific fixed effects would remove all level effects in international terrorism from our estimates given that the unit of observation is the country dyad year. They would thus very likely capture some of the spatial dependence via civilizational rallying effect that we seek to isolate from spatial clustering. Accordingly,

[4] Franzese and Hays (2008) discuss the source and nature of this problem in some detail. If the determinants of spatial patterns in the dependent variable are observed (i.e. the regressors show spatial patterns), one often refers to this as spatial clustering, whereas unobserved spatial patterns are usually called unobserved spatial heterogeneity (spatial patterns in errors). For the purpose of the analysis here, as a shortcut we mainly use the term spatial clustering to cover both observed and unobserved spatial heterogeneity.

the inclusion of country dyad-specific fixed effects would probably lead us to under-estimate spatial dependence. In other words, the inclusion of civilization dyad-specific dummy variables avoids an over-estimation of spatial dependence that would follow from failing to account for spatial clustering, but also avoids the under-estimation of spatial dependence that would follow from the inclusion of country dyad-specific fixed effects.

Formally, the inclusion of civilization dyad-specific dummy variables leads us into extending equation (1) to:

$$y_{ijt} = \beta_1 \sum_{k \neq i} w_{ik} \ln\left(\sum_{m=t-2}^{t} y_{kjm} + 1\right) + u_c + \ldots + \varepsilon_{ijt} \quad , \tag{2}$$

where u_c are the time-invariant fixed effects, representing the 28 possible inter-civilizational combinations.

Modeling Common Shocks and Common Trends

The problem of modeling common shocks and common trends is widely discussed in the theoretical literature on spatial econometrics (e.g., Beck et al. 2006; Franzese and Hays 2007; Plümper and Neumayer 2010a), and methodologists usually suggest that applied researchers control for common trends by adding the lagged dependent variable to the list of regressors (e.g., Hays 2003, Franzese and Hays 2007, Swank 2006) and account for common shocks by adding period-specific time dummies (e.g. Bailey and Rom 2004; Franzese and Hays 2007). Following this advice, we include year-specific time dummy variables to account for common shocks. However, as concerns common trends we have chosen a different modeling option. First, we include a variable that measures the total annual sum of terrorism originating from country *i* (independent of the target country of the victims but minus the number of terror incidents in the dyad under observation) and another variable that measures the total annual

sum of terrorism suffered by individuals from country *j* (independent of the origin or source country of the terrorists but, again, minus the number of incidents in the dyad under observation). The purpose of these variables is to account for the general, but time-varying, terror propensity of terrorists' home and the target countries, respectively. As with the spatial lag variables, these variables enter in logged form for the reasons explained in section 3. Second, we include civilization dyad-specific time trends to account for common trends and dynamics in all countries of a particular inter-civilizational combination. These extensions to equation (2) lead to:

$$y_{ijt} = \beta_1 \sum_{k \neq i} w_{ik} \ln(\sum_{m=t-2}^{t} y_{kjm} + 1) + \beta_2 \ln(\sum_{n \neq i,j} y_{int} + 1) + \beta_3 \ln(\sum_{n \neq i,j} y_{njt} + 1) + u_c + u_c \cdot year + T_t + ... + \varepsilon_{ijt} \quad (3)$$

where $\sum_{n \neq i,j} y_{int}$ is the time-varying general terror propensity of (potential) terror country *i*, $\sum_{n \neq i,j} y_{njt}$ is the time-varying general terror propensity of (potential) target country *j*, $u_c \cdot year$ represent civilization dyad-specific time trends, while T_t capture global year-specific time fixed effects. In sum, estimation equation (3) represents a conservative research design. If we find evidence for spatial dependence in this design, we can be fairly certain that such evidence is not spurious.

5. Results

We first present in table 2 estimation results, in which the spatial lag variables are only conditioned on the Cold War (1970 to 1989) and post-Cold War periods (1990 to 2005) and

no distinction is made according to specific inter-civilizational combinations.[5] A statistically significant coefficient of the spatial lag variable in the post-Cold War period would suggest spatial dependence during this period, while a statistically significant positive difference between the coefficients of the post-Cold War and Cold War spatial lag variables would suggest a significant increase in spatial dependence after the end of the Cold War.[6] Both effects would be consistent with Huntington's predictions. The first model in table 2 excludes civilization dyad-specific dummy variables and time trends and therefore is likely to lead to an upward biased coefficient of the spatial lag variable. The second model includes civilization dyad-specific dummy variables, while the third model additionally includes civilization dyad-specific time trends. This last specification is the most stringent and conservative one.

[5] We let the post-Cold War period start in 1990, but our results are fully robust to a start up to two years prior or after this date. Our sample starts in 1970 since with the inclusion of the spatial lag variables we lose the first two years of the Iterate dataset.

[6] Testing for whether the difference between the two estimated coefficients is statistically significantly different from zero is similar to tests for a kind of structural break at the end of the Cold War that others have done (Chiozza 2002; Bolks and Stoll 2003; Gartzke and Gleditsch 2006).

Table 2. Estimation results with spatial lags conditioned on Cold War versus post-Cold War periods only.

	model 1 Civilization dyad dummies excluded	model 2 Civilization dyad dummies included	model 3 Civilization dyad dummies and trends included
specific source contagion (ln)	0.0782**	0.0589**	0.0551**
(Cold War period)	(0.0205)	(0.0186)	(0.0183)
specific source contagion (ln)	0.105**	0.0865**	0.0607**
(post-Cold War period)	(0.0193)	(0.0176)	(0.0186)
pop terror country (ln)	0.194**	0.274**	0.284**
	(0.0293)	(0.0344)	(0.0346)
pop target country (ln)	0.460**	0.521**	0.523**
	(0.0366)	(0.0425)	(0.0427)
distance (ln)	-0.316**	-0.245**	-0.251**
	(0.0350)	(0.0328)	(0.0329)
common border	0.289	0.288	0.269
	(0.259)	(0.190)	(0.190)
GDP pc terror country (ln)	-0.0949*	-0.0792	-0.103*
	(0.0372)	(0.0516)	(0.0526)
GDP pc target country (ln)	0.445**	0.439**	0.448**
	(0.0362)	(0.0500)	(0.0505)
democracy terror country	-0.00235	-0.00255	0.00226
	(0.00596)	(0.00649)	(0.00645)
democracy target country	0.00782	-0.00306	-0.00160
	(0.00732)	(0.00877)	(0.00896)
terror propensity terror country (ln)	1.274**	1.221**	1.198**
	(0.0339)	(0.0338)	(0.0342)
terror propensity target country (ln)	0.685**	0.616**	0.626**
	(0.0637)	(0.0540)	(0.0532)
same nationality	2.554**	2.586**	2.564**
	(0.318)	(0.303)	(0.305)
Observations	567413	567413	567413
Chi-square test: equal coefficients	2.86	3.20	0.11
(p-value)	(0.09)	(0.07)	(0.74)

Standard errors clustered on country dyad in brackets. Year dummies always included.
* $p(z)<0.05$ ** $p(z)<0.01$.

Before turning to the estimated coefficients of the spatial lag variables, which are our main interest, we briefly discuss results on the control variables. As expected, both population sizes of the terrorists' home country and of the target country have a positive effect. In other words, more populous countries generate more terrorism and suffer more from terrorism. As with many other forms of violent conflict, distance matters: The number of terrorist incidents declines as the geographical distance between the terrorists' home country and the target country increases. Contiguous country dyads do not experience more international terrorism, however.

We find evidence that a higher per capita income in the terrorists' home country lowers terrorism (except in model 2), even though our results say of course nothing on the economic conditions faced by the individual terrorists themselves. As expected, targets from richer countries are more attractive to international terrorists. The type of regime has no impact on patterns of international terrorism in either the terrorists' home country or the target country. Conditional on the other explanatory variables and particularly controlling for per capita income, which is highly correlated with democracy, as well as the general terror propensity of terrorists' home and target countries, democracies do not differ from autocracies. As expected, a higher general propensity of nationals from the origin country to generate terrorism raises terrorism for country dyads formed by this country. Similarly, a higher general propensity of nationals from the target country to suffer from terrorism raises terrorism for dyads in which this country is the target country of the directed country dyad.

Turning now to the specific source contagion spatial lag variables, which capture Huntington's civilizational rallying hypothesis, we find that the coefficients for the spatial lag variables are statistically significantly different from zero in the Cold War and the post-Cold War period in all model specifications. While the coefficients become smaller the more stringent and conservative our estimation strategy, there is nevertheless evidence consistent with Huntington's hypothesis of a rallying effect even in the model that includes both civilization dyad dummies and trends. However, the difference in the estimated coefficients between the two time periods is only statistically significant even at the more generous 10 per cent level in models 1 and 2. Moreover, with more than half a million observations standard errors tend to be low and coefficients are often statistically significant even if the substantive importance of effects can be small. This is what we find for the spatial lag variables: in model 3, a one standard deviation increase in the spatial lag variables during the Cold War and post-Cold War period lead to an increase of only 4.4 and 5.2 per cent, respectively, in the expected rate of terror incidents (other variables at mean values). In comparison, a one standard

deviation increase in the population size and per capita income of the target country increases the expected count of terror incidents by 125 and 104 per cent, respectively, while a one standard deviation increase in the terror propensity of the terror country raises the expected count by 128 per cent. Even a move from minimum to maximum in the post-Cold War spatial lag variable increases the expected count of terror incidents only by a relatively modest 89 per cent.

Next, we focus on Huntington's argument that terrorism is more likely to be used in some inter-civilizational conflicts than in others and particularly in the clash between the Muslim world and the West. Thus, in the models reported in table 3 we no longer simply look at global spatial dependence in international terrorism, but we model more carefully Huntington's proposition that terrorism is a weapon used more in some inter-civilizational conflicts than in others. In table 3, we take the spatial lag variable, which has already been conditioned on the Cold War and post-Cold War periods, and condition it further on specific inter-civilizational combinations. Table 3 exclusively reports coefficients of the specific source contagion spatial lag variables since the coefficients of the control variables remain robust and do not matter for testing Huntington's rallying prediction. To save space, we only show two sets of estimations each, namely the one without civilization dyad-specific controls and the one with both civilization dyad-specific dummies and time trends included.

Starting with the non-Western against Western combination (models 4 and 5), we find evidence for civilizational rallying effects in both model specifications for dyads falling into the non-Western vs. Western civilizational combination for both the Cold War and the post-Cold War period. The coefficients are slightly larger in the post-Cold War period, but not significantly so. As before, the substantive impact of the rallying effect remains small. A one standard deviation increase in the post-Cold War spatial lag variable leads to a 18.9 (model 4) and 10.7 per cent (model 5) increase in the expected rate of terror incidents.

Models 6 and 7 condition the spatial lag variables on the Islam versus non-Islamic civilizational combinations, whereas models 8 and 9 do the same for the Islam versus West combinations. For both combinations, there is evidence for civilizational rallying effects in the post-Cold War period in both model specifications. Moreover, the coefficients of the spatial lag variable increase significantly from the Cold War to the post-Cold War period. In fact, the spatial lag coefficients are not even significantly different from zero in the Cold War period, suggesting that there was no rallying effect during this time period for dyads of the Islam versus non-Islam and Islam versus West combinations. For the other combinations, there is some evidence for rallying effects in both periods, but the coefficient either decreases in the post-Cold War period or if it increases, the difference is far from statistically significant.

As before, in substantive terms the rallying effect seems to be rather small though. A one standard deviation increase in the respective spatial lag variables raises the expected count of terrorist incidents by between 17.8 and 9 per cent (Islam versus Rest) and by 29.9 and 15.5 per cent (Islam versus West) in the post-Cold War period, depending on whether civilization dyad dummies and time trends are included in the model specification or not (all other variables at mean values). While certainly larger than the estimated substantive effects for all inter-civilizational combinations, these estimated effects are still relatively modest. Altogether, there is thus evidence for Huntington's rallying effect in all models, including the most stringently and conservatively specified ones, but the rallying effect, whilst existent, seems to be relatively small in size.

Table 4. Estimation results with spatial lags conditioned on specific inter-civilizational combinations and Cold War versus post-Cold War periods.

	model 4	model 5	model 6	model 7	model 8	model 9
Civilization dyad dummies and time trends	*no*	*yes*	*no*	*yes*	*no*	*yes*
Coeff. specific inter-civilizational comb.:	*Non-Western vs. West*	*Non-Western vs. West*	*Islam vs. non-Islam*	*Islam vs. non-Islam*	*Islam vs. West*	*Islam vs. West*
Specific source contagion Cold War (ln)	0.0788**	0.0556**	0.0145	0.00811	0.0156	0.00793
	(0.0205)	(0.0183)	(0.0305)	(0.0318)	(0.0304)	(0.0318)
Specific source contagion post-Cold War (ln)	0.104**	0.0600**	0.113**	0.0616**	0.108**	0.0569*
	(0.0192)	(0.0186)	(0.0211)	(0.0227)	(0.0209)	(0.0226)
Chi-square test: equal coefficients (p-value)	2.60	0.07	17.62	3.40	16.14	2.87
	(0.11)	(0.79)	(0.00)	(0.07)	(0.00)	(0.09)
Coeff. specific inter-civilizational comb.:	*Other*	*Other*	*Other*	*Other*	*Other*	*Other*
Specific source contagion Cold War (ln)	-0.216	-0.152	0.0933**	0.0686**	0.0933**	0.0690**
	(0.179)	(0.174)	(0.0202)	(0.0192)	(0.0202)	(0.0192)
Specific source contagion post-Cold War (ln)	0.246*	0.106	0.0847**	0.0566*	0.0943**	0.0634**
	(0.117)	(0.124)	(0.0263)	(0.0243)	(0.0262)	(0.0241)
Chi-square test: equal coefficients (p-value)	4.96	1.61	0.19	0.38	0.00	0.08
	(0.03)	(0.20)	(0.66)	(0.54)	(0.96)	(0.78)
Observations	567413	567413	567413	567413	567413	567413

Standard errors clustered on country dyad in brackets. Control variables and year dummies always included. * p(z)<0.05 ** p(z)<0.01.

6. Conclusion

In this article, we have tested the hypothesis that international terrorism is spatially dependent along civilizational lines in the post-Cold War period and particularly so for certain inter-civilizational combinations. We found indeed evidence for this: even when we control for common trends and shocks and spatial clustering, the estimated coefficients of the spatial lag variable remain statistically significantly different from zero in the post-Cold War period. While the post-Cold War period coefficients are not higher than the ones from the Cold War period in the general estimations of model 3 and for the non-Western versus Western combination in any of the model specifications, we find a significant increase in the coefficient sizes of the spatial lag variables for the Islam versus Rest and Islam versus West combinations between the two time periods, which is consistent with Huntington's predictions. With several hundred thousand observations, coefficients are easily statistically significant. We have therefore also assessed the substantive importance of the estimated effects. Here, we found that any rallying effect is only rather modest in size. In sum, while we find evidence consistent with Huntington's predictions, in substantive terms rallying effects seem to be of relatively small importance.

One may also wonder whether there are other explanations for our findings. From a theoretical perspective one would expect the very same spatial pattern if, say, radical Islamic groups were not rallying in the spirit of a Clash of Civilizations, but competing with each other for scarce resources provided by supporters with similar political goals. In other words, competition between terrorist groups, which have similar ideologies, for scarce support in terms of finance, logistics and the recruitment of terror agents, may force these groups to match successful inter-civilizational terrorist attacks of rivaling groups by strengthening their own activities.[7] With the data currently available, we cannot discriminate between these two explanations, which may of course be both valid at the same time. Future research should try to tackle this question, but it is not entirely clear whether this

[7] The fact that empirical evidence is consistent with more than one theory is known as under-determination.

can be successfully done. Micro-level research on the strategic fundraising behavior of different terror groups might provide an answer. Needless to say, however, that such research is difficult to undertake and potentially dangerous to researchers as well.

If Huntington's hypothesis is correct and rallying effects exist particularly amongst Islamic terrorist groups, then this makes dealing with the threat they pose very difficult. From the perspective of counterterrorism, primarily focusing on a single radical group or a single country is not a promising strategy due to the contagion effects. Rather, a broad strategy is needed which simultaneously deals with the political and other root causes of radical Islamic terrorism and its various manifestations across the Islamic civilization. The traditional counterterrorism strategies will be of limited effectiveness in the presence of decentralized groups whose terror spills over into terror from other groups with similar ideologies and strategies.

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