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The origins of terrorism: cross-country estimates of socio-economic determinants of terrorism

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Abstract

Recognizing that the empirical mainstream does not attribute a strong role to socio-economic development in determining terrorist activity, we present an alternative approach to this issue. First, we introduce a theoretical reminder, which argues that a country's socio-economic situation affects terrorists' behavior by governing the opportunity costs of terrorism. Then, we employ a series of negative binomial regressions for 110 countries between 1971 and 2007 to test the hypothesis that poor socio-economic development is conducive to terrorism. Our main finding is that socio-economic variables indeed also matter to terrorism, contrary to what the empirical mainstream suggests. Our findings imply that countries may benefit from economic success (and from policies fostering it) in terms of a reduction in terrorist activity.

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1. Introduction

Which strategies are truly helpful in the *war on terrorism*? Given the (potentially substantial) costs of terrorism, an answer to this question is certainly of vital importance.[1] The bulk of empirical studies analyzing the causes of terrorism argue that terrorism is a *political and demographic* creature (e.g., Krueger and Maleckova, 2003; Tavares, 2004; Abadie, 2006; Kurrild-Klitgaard, Justesen and Klemmensen, 2006; Dreher and Gassebner, 2008; Krueger and Laitin, 2008; Piazza, 2008; Savun and Phillips, 2009; Basuchoudhary and Shughart, 2010; Choi, 2010; Kis-Katos, Liebert and Schulze, 2011).[2] That is, they find that terrorism is rooted in, e.g., political repression, state failure, identity conflict and foreign policy behavior. However, they do not find that poor socio-economic development matters strongly to the genesis of terrorism, so that political and demographic variables trump economic ones.[3] Therefore, the implicit policy advice deduced from the empirical mainstream is to fight terrorism by overcoming political and demographic problems and crises, but not by means of socio-economic development.

With this study we seek to contribute to the ongoing academic discourse over the causes of terrorism. We argue that a view, which underestimates the role of socio-economic development in terrorism does not tell the whole story about the emergence of violence. It is our understanding that the opportunity costs of all stakeholders do not only depend on political and demographic, but also *socio-economic variables*. We contribute to the academic discourse in two ways. First, while many studies on the causes of terrorism rely on (however plausible) ad hoc hypotheses, we introduce a *theoretical reminder* to show that the emergence of terrorism may (at least partially) depend on a set of variables reflecting the socio-economic environment of terrorist and their supporters. This short reminder is presented to show that there is indeed a theoretical underpinning to the (popular but contested) hypothesis that poor socio-economic conditions result in terrorism. Here, we center on the governing influence of these very conditions on terrorism's *opportunity costs*, which enter the terrorists' calculus. Our approach is indirectly corresponding with contributions by Bernholz (2004) and Wintrobe (2006a) who argue that supreme values (i.e., preferences shaped by ideology) also play a role in terrorism. In our framework, we keep these values constant and focus on the role of socio-economic conditions. When conditions are poor, the rewards from terrorism (e.g., solidarity, status) become particularly attractive, while the opportunity costs of terrorism are low (e.g., because economic, non-violent alternatives are scarce). Our reminder thus

[1] Terrorism may damage economic activity by, e.g., reducing trade (Nitsch and Schmacher, 2004), FDI flows (Enders and Sandler ,1996) and economic activity in certain industries, e.g., the tourism sector (Enders, Sandler and Parise, 1992). Such negative effects may result in a reduction of overall economic growth (Abadie and Gardeazabal, 2003; Gupta et al. 2004; Crain and Crain 2006; Gaibulloev and Sandler, 2008), matching the evidence that political instability is detrimental to growth (e.g., Jong-A-Pin, 2009). Furthermore, terrorism may produce political costs, e.g., by affecting voter behavior (Berrebi and Klor, 2008).

[2] Krieger and Meierrieks (2011) provide an overview on the empirical literature on the determinants of terrorism.

[3] Rather, some of these studies (e.g., Krueger and Maleckova, 2003) point at the high (individual) level of education and good economic status of terrorists that are active in, e.g. the Arab-Israeli conflict.

serves the purposes of showing that terrorism may not only be a political and demographic, but also socio-economic creature.

Second, we provide an *empirical test* of the predictions deduced from the reminder, putting a special emphasis on the national (aggregate) socio-economic situation of 110 countries between 1971 and 2007, where we acknowledge that an empirical analysis of the determinants of terrorism may be associated with methodological problems (finding reliable data, cautious interpretations etc.). As one major innovation, we employ a dataset that contains information on domestic and transnational terrorism.[4] We find that – in contrast to the findings of the empirical mainstream (that have potentially resulted from an analysis of transnational terrorism only) but consistent with our expectations – poor socio-economic conditions (as indicated by, e.g., low levels of investment, consumption and economic openness) indeed make terrorism more attractive. The empirical findings of our contribution thus add to a rather small body of empirical literature that finds (in contrast to the empirical mainstream) that terrorism is indeed (partly) rooted in poor socio-economic conditions that are reflected in, e.g., insufficient social welfare policies, economic discrimination and low levels of economic openness (e.g., Burgoon, 2006; Blomberg and Hess, 2008; Krieger and Meierrieks, 2010, Caruso and Schneider, 2011). Our findings thus imply that terrorism may also be fought by fostering socio-economic development.

The rest of this paper is organized as follows. In Section 2 we provide a theoretical reminder that focuses on the behavior of terrorists and their environment, where this behavior is shown to be influenced by the opportunity costs of terrorism reflected in (country-specific) socio-economic conditions. In Section 3 we introduce the methodology and data used to empirically investigate the validity of our theoretical considerations. We present and discuss our empirical findings in Section 4. Section 5 concludes.

2. Theoretical reminder: the opportunity costs of terrorism

This section introduces a theoretical reminder to illustrate how socio-economic conditions may matter to the emergence of terrorism, namely by influencing individual incentive structures.

Here, the basic assumption is that terrorists are rational individuals (e.g., Sandler and Enders, 2004; Caplan, 2006). Following an economic analysis of terrorism, terrorists weigh off the costs of terrorism against its benefits to determine their level of terrorist activity. This means answering the question of what terrorists want (benefits from terrorism) and what they are willing to give up (costs of terrorism). If terrorism is indeed rational, it seems intuitive to model it as one of several choices driven by economic constraints. Here, the concept of opportunity costs is suitable for the theoretical analysis of the emergence of terrorism, as it indicates what terrorists need to sacrifice when choosing to use violence.

[4] The empirical literature on terrorism determinants has mainly analyzed the origins and targets of transnational terrorism due to a lack of data on domestic terrorism. *Transnational terrorism* refers to terrorism involving

One may argue that conducting terrorism (e.g., killing other people arbitrarily to meet certain objectives) also requires strong emotions or beliefs. Wintrobe (2006) develops a model where individual terrorists choose between two (emotional) goods, namely intellectual independence and group solidarity. The potential terrorist trades independence against solidarity – and identity, as Harrison (2006) stresses – and strong leadership. Wintrobe's model shows that terrorist activity may depend on individual desires and emotions, where the demand for solidarity again makes terrorism (including suicide terrorism) rational. Similarly, Bernholz (2004) argues that true believers belief in the supreme value of their case and trade all other forms of (unnecessary consumption against means to increase the number of believers, among them terror. That is, these theoretical approaches also implicitly argue with the (opportunity) costs of terrorism. Our approach is similar to these ideas. However, we argue more generally. Without directly referring to supreme values as these authors do, we may think of the emergence of terrorism (i.e., its observed level) as a result of a trade-off between two goods. The two goods we consider are individual income and wealth (i.e., individual socio-economic conditions) that result from non-violence and mental rewards from terrorism. Mental rewards can include group solidarity (e.g., family or support), status and power. In the case of suicide terrorism or if a terrorists is killed in action, it may also include the status and honor of martyrdom and support for the family.[5]

This incentive structure is used by the top-level of a terrorist organization to attract active terrorists and other supporters. Its members can be characterized by a goal they want to meet via the use of different instruments.[6] One instrument is extremism, in our case terrorism. It is a means not an end. The decision to use a certain instrument is driven by a rational calculus (Wintrobe, 2006b). The incentive structure itself (i.e., the associated opportunity costs considerations) matter to two groups in a society. First, they matter to the active terrorists themselves (i.e., the 'foot soldiers'). Clearly, they choose between non-violence and violence. Second, there is the terrorists' environment, i.e., friends, parents or sympathizers in the general public. They are also expected to weigh off the opportunity costs of support for violence (e.g., reduce economic activity) against its mental rewards. The level of sympathy, acceptance or support for terrorist activities from the terrorists' environment is one factor that helps terrorism to develop, e.g., by allowing terrorist to find retreats or gain financial aid. The more support the terrorists get from the environment, the lower are the opportunity costs for individuals to become terrorists.[7] Note that such opportunity cost considerations not only

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citizens, groups, territory etc. of more than one country. *Domestic terrorism* refers to terrorism that only affects one country.

[5] Even the restoration of individual forgone honor can be a reward. It is reported that groups force group members to commit suicide bombing by, e.g., threatening to do harm to the members' relatives. For instance, such a mechanism seems to be at work when considering young female suicide attackers who have been subject to sexual harassment in Islamic countries. To restore their self-appreciation, suicide bombing seems to be a last resort (Harrison, 2006).

[6] Short-run goals may comprise a destabilization of attacked economies and polities as well as publicity, while long-run goals may include a redistribution of power and wealth not enforceable in the ordinary political process (e.g., Frey and Luechinger, 2003).

[7] Harrison (2006) also argues that the terrorists' environment takes into account the (opportunity) costs and benefits of violence. For instance, terrorist supporters weigh off the identity created by terrorism against the

depend on the incentive structure offered by top-level of a terrorist organization but also on the influence of the local, domestic and foreign governments that try to combat terrorism. They want to prevent individuals from becoming terrorists. Needless to say, their influence depends on the local, intellectual and mental distance to the second and third group.

We have thus established that (following economic theory) the predisposition of an individual to become a terrorist or support terrorism ought to crucially depend on the opportunity costs of terror. Ultimately, terror is chosen as a tool to gain mental rewards (e.g., for terrorist 'foot soldiers') and reach abstract political objectives (e.g., for top-level terrorists) as long as marginal benefits exceed marginal (opportunity) costs (e.g., Frey and Luechinger, 2003; Harrison, 2006). In the rest of this reminder, we want to illustrate how poor socio-economic conditions sway these opportunity costs in ways that make terrorism more attractive.

We distinguish between two choices. First, there is the decision to support and/or become a terrorist, i.e., to consume mental rewards from terrorism (e.g., solidarity, status, supreme values). Second, there is the choice of non-violence, i.e., to consume regular goods and services. Analogous to the analysis of income and substitution effects in microeconomics, this decision can be analyzed in terms of the different utilities derived from either living in peace – and making a living on earth – or engaging in and/or supporting activities that lead to terrorist activity, thereby qualifying for mental rewards. In Figure 1, consider an original budget constraint, represented by the line DE, together with indifference curves. The individual's utility is maximized in A.

If a regular law-abiding life becomes more attractive, then the budget constraint moves to DF. In the case of given preferences, utility is now maximized in C. The move to B shows the income effect. This cannot be the new optimum, which is represented in C. The interesting part of the story is the move from B to C, which represents the substitution effect of the change in the budget restriction. The relative price of material wealth to mental rewards decrease so that the individual now prefers more consumption and fewer activities related to terror.[8] Thus, the opportunity costs of terrorism have increased. If, however, the opportunity costs decrease by a sufficiently large degree, the budget constraint moves to DG, and terror becomes increasingly attractive. In an extreme case, a corner solution is reached and utility is maximized in D. As D is located both on the new (DG) and on the original budget constraint (DE), the only relevant effect here is the substitution effect. This corner solution may be interpreted as the choice of an individual to commit a suicide attack.

benefits from non-support, basing their actual decision on the opportunity costs of terror. As an example, parents may support the decision of their child to become a (suicide) terrorist when the child's future is unpromising (e.g., because unemployment is high) and when (as an alternative to non-violence) the child's actions as a terrorist guarantee a martyr status in the society and thus financial support from terrorist organizations.

[8] The individual in question may be a terrorist, a leader of a terrorist group or a third person sympathizing with terrorism.

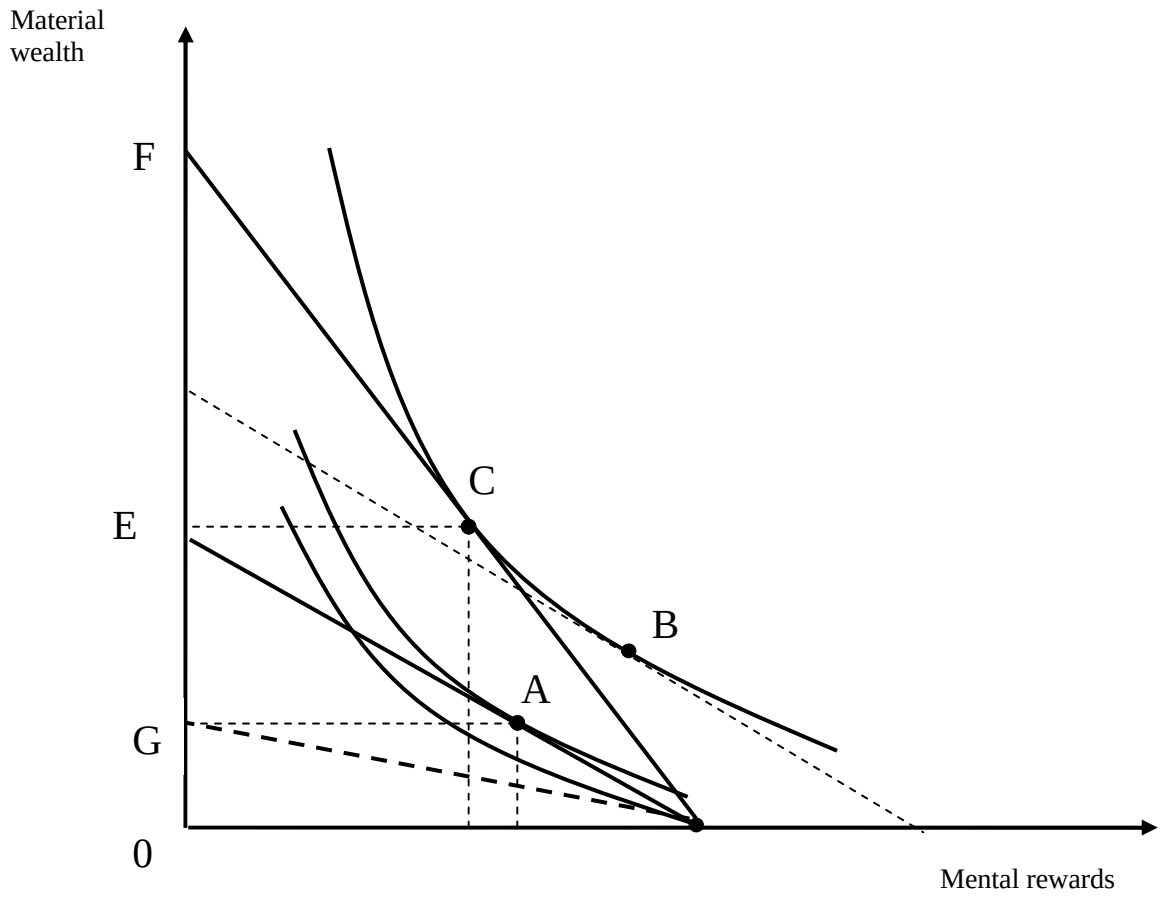

Fig. 1. Choice between the consumption of goods and mental rewards

Which factors may drive the opportunity costs of terrorism? The empirical mainstream seems to suggest that political factors (and not material conditions) drive them. However, poor (country-specific) socio-economic conditions (e.g., poverty, slow growth, poor investment, trade disadvantages) may influence the cost-benefit considerations of terrorists and their environments just as well. For instance, as an 'ordinary' (non-violent) life becomes more attractive, the budget constraint moves to DF (Figure 1). The increased attractiveness of non-violence (the move of the budget constraint) may be a consequence of an increase in economic participation (e.g., strong economic growth). As argued by Blomberg, Hess and Weerapana (2004) economic advancement and participation (e.g., employment) is expected to increase in good economic times, making violence less likely. Conversely, when the opportunity costs decrease by a sufficiently large degree (e.g., because there is an economic downturn), the budget constraint moves to DG so that terrorism becomes increasingly attractive.

We can apply the theoretical thoughts both to active terrorists and to their supporters. Although the latter do not commit the terrorist acts, their propensity to be sympathetic

towards terrorist activity is a function of the opportunity costs. The better the socio-economic conditions today and prospects for the future, the less sympathy potential supporters are expected to have for terrorists – they simply have more to lose. In other words, an outward shift of the budget constraint in Figure 1 reduces the public support for terrorism and thereby indirectly the level of terrorist activity.

Our theoretical reminder has thus illustrated how socio-economic conditions may influence the opportunity costs of terrorism and thus the level of terrorist violence in a country. As we shall discuss in the next section, a variety of socio-economic variables may matter to terrorism. Here, we shall test whether terrorism is rooted in countries where the opportunity costs of terrorism are low, i.e., where poor socio-economic conditions abound (net of the influence of political and demographic conditions).

3. Empirical method and data

Ideally, we would like to test our hypothesis that poor socio-economic conditions lead to terrorism from both a macro and micro perspective. Unfortunately, the individual decision to become a terrorist (or support terrorism) and its dependence on socio-economic characteristics in the country of origin of terrorism are not observable to us in a systematic way.[9] We are, however, able to observe country characteristics (i.e., macro variables). In line with a plethora of empirical studies that have been reviewed by Krieger and Meierrieks (2011), we argue that these macro variables (which indicate political, demographic and socio-economic conditions) provide the incentive structure for both the active terrorists and their environment supporting or opposing the terrorist activities. Thus, they also reflect the opportunity costs of terrorism, albeit in a less-than-perfect way. In other words, macro conditions do not necessarily reflect the individual motivation to become a terrorist. However, finding a statistically robust association between a country's (national) political, demographic and socio-economic situation and (national) terrorist activity ought to give an *indication* that the (micro) mechanisms outlined in the theoretical reminder (Section 2) are valid. For instance, poor economic growth or low investment (on national levels) ought to indicate reduced economic activity, making it more likely that non-violence (on individual levels) becomes less attractive (e.g., by constraining employment or entrepreneurship), in turn making violence or its support more attractive. In particular, we believe it to be a legitimate assumption that macro variables correlate with terrorist activity, given that the observed level of violence does not only depend

[9] Some studies (e.g., Krueger and Maleckova, 2003; Krueger, 2008), however, use micro level data to assess the micro determinants of terrorism. While the results of these studies are revealing in terms of identifying the correlates of participation in, e.g., homegrown Islamic terrorism in the US, they do not enable us to draw general conclusions about the role of socio-economic variables in terrorism. However, we invite future micro (and macro) research on this issue which also ought to focus on the socio-economic conditions of those parts of the population from which terrorism predominantly emerges (in addition to a focus on the general socio-economic conditions within a country).

on the opportunity cost considerations of active terrorists (i.e., a rather small nucleus) but also – as shown above – on the support of (potentially large) parts of the population.[10]

For our statistical analysis we indicate the level of terrorist activity by the *number of terrorist incidents* in a given country and year. We compile data for our dependent variable (and the explanatory variables) for 110 countries between 1971 and 2007.[11] The data for our dependent variable is drawn from the *GTD*, the *Global Terrorism Database* (LaFree and Dugan, 2007).[12] The *GTD* contains information on domestic and transnational terrorism. Because of data constraints past empirical analyses have strongly focused on the determining factors of transnational terrorism, although domestic terrorism is a more common phenomenon.[13] Such a focus may lead to misleading results regarding the role of the economy in terrorism, in particular because transnational terrorism is more likely to be rooted in international political rather than in poor socio-economic conditions. For instance, Dreher and Gassebner (2008) and Savun and Phillips (2009) find that transnational terrorist activity is related to foreign policy behavior. However, such factors are less likely to matter to the (more common) phenomenon of domestic terrorism (e.g., Savun and Phillips, 2009). As our study accounts for domestic and transnational terrorism, we are less likely to overestimate the role of (international) political factors in the genesis of terrorism. Rather, we expect to find a close relationship between poor socio-economic conditions and terrorism, net of the influence of political and demographic variables.

Given that our dependent variable is an event-count variable (non-negative integers), we need to apply a regression method that is specifically designed to cope with this kind of data. In contrast to the Poisson distribution, for which the mean is restricted to equal the variance, the negative binomial distribution is able to account for a variance that is larger than the mean (overdispersion). Due to the overdispersion of our dependent variable, we thus use a *negative binomial regression model* for panel data.[14] As noted by Krieger and Meierrieks (2011), negative binomial regression models are the standard tool in empirical analyses of the determinants of terrorism. We use a random effects model, given that in a fixed effects model these effects perfectly predict the outcome when no terrorism occurs in a specific country during the period of observation. Also, the introduction of fixed effects may mask the influence of slowly changing or constant variables (Lai, 2007, 305). In most specifications, we include year and regional dummies to account for heterogeneity and serial correlation. In some specifications, we also consider the influence of country-fixed effects (acknowledging potential problems with their introduction) and a lagged dependent variable, which may also

[10] See Bueno de Mesquita and Dickson (2007) for a study of the linkages between terrorism and popular support.

[11] A list of countries and the summary statistics are given in the appendix.

[12] Note that the GTD data for 1993 is incomplete. We thus follow Choi (2010) and interpolate the terrorism data for 1993 based on the average between the previous and following years. However, our main findings (reported below) remain stable when we run our analysis without the interpolated 1993 data.

[13] For instance, Abadie (2006, 50) argues that in 2003/04 transnational terrorism only accounted for 15% of the total terrorist activity. Similarly, Sanchez-Cuenca and Calle (2009, 32) argue that domestic terrorism "represents by far the greatest part of all terrorist violence".

[14] Cameron and Trivedi (1998) provide a more detailed discussion of count data regressions. Note that we discuss the robustness of our findings to methodological changes below.

help account for heterogeneity, serial correlation and a bias from the omission of variables (e.g., Burgoon, 2006). Certain explanatory variables (as described below) enter the estimation model in logged form to account for skewness. All explanatory variables (except the constant ones) enter the model in lagged form *(t-1)* to avoid problems associated with reverse causation.

Our main hypothesis is that poor socio-economic conditions (that reflect low opportunity costs of terrorism) are conducive to terrorism. For this study, we use a number of correlates of socio-economic success to indicate such linkages, where all series are drawn from the most recent update of the *PENN World Table* (Summers and Heston, 1991).

We include the (logged) *real GDP per capita* and its *square*. On the one hand, a higher per capita income is expected to make terrorism less likely due to the increasing opportunity costs of terrorism (that result from a high level of material wealth). On the other hand, however, a higher per capita income may also reflect a higher state capacity (e.g., Fearon and Laitin, 2003). While a higher state capacity makes an open rebellion less likely (e.g., Fearon and Laitin 2003), it may make clandestine activity (i.e., terrorist activity) more likely, as argued by Blomberg, Hess and Weerapana (2004). That is, the relationship between a country's per capita income and terrorism ought to be non-linear. Up to a certain level, more income means more terrorism (as the state capacity effect prevails). Thereafter, more income means less terrorism (as an income effect prevails in the richest countries).

The (logged) level of consumption (indicated by the *consumption component of the real GDP*) may also reflect national socio-economic conditions. Intuitively, a higher level of consumption means less government intrusion into the economic life and thus a higher level of socio-economic satisfaction (e.g., Headey, Muffels and Wooden, 2008).

A country's level of trade openness (measured as the logged *ratio of exports and imports to the real GDP*) may also indicate a country's socio-economic situation. In short, higher levels of economic openness are expected to correlate with higher levels of growth and socio-economic development (e.g., Levine and Renelt, 1992; Dollar and Kraay, 2004). Li and Schaub (2004) also find that higher levels of trade openness make terrorism less likely by improving a country's level of socio-economic development.

The (logged) level of investment (indicated by the *investment component of the real GDP*) is another variable potentially capturing national socio-economic conditions. Here, more investment ought to result in less terrorism. For instance, higher levels of investment usually correlate with stronger economic development, which in turn means higher levels of economic participation and socio-economic satisfaction (e.g., Levine and Renelt, 1992).

In one specification, we also control for the *rate of economic growth*, which reflects a country's short-run economic performance. As noted by Blomberg, Hess and Weerapana (2004), in poor economic times terrorism ought to become more attractive due to its low opportunity costs. For instance, slow growth may coincide with comparatively high levels of unemployment and low levels of economic participation.

We, however, acknowledge that the empirical mainstream argues that terrorism may also be driven by political and demographic factors. Following the literature review by Krieger

and Meierrieks (2011), we thus employ a number of non-economic *control variables* that may also influence the terrorists' calculus.

Democracy: There is no academic consensus regarding the relationship between democracy and terrorism (Krieger and Meierrieks, 2011).[15] On the one hand, democracies may be less vulnerable to terror because they offer means of political participation, reducing the need to use violence to voice dissent. Political groups do not have to resort on extremist means to meet their political ends, unless they aim at abandoning democracy. Indeed, in many democracies, left or right splinter groups and parties are acting within the political spectrum and try to convince voters with campaigns rather than with violence. On the other hand, democracies provide certain civil liberties, which consequently make clandestine activity less costly. Also, democratic countries face further institutional constraints (e.g., the need to form broad coalitions, an independent judiciary) that make it less likely that means of military and political repression can be effectively used to counter terrorism (e.g., Li, 2005). Potentially, this may foster terrorism in democracies.[16] Furthermore, because data on terrorism (e.g., the *GTD* data) is collected from media sources, a reporting bias may be introduced, given that democracies are less likely to introduce restrictions on the coverage of terrorist activity. This potential reporting bias – discussed in Li (2005) and Drakos and Gofas (2006) – also makes it necessary to control for a country's level of political development (indicated by the *Polity2 score* from the *POLITY IV Project*).[17]

Regime Stability: Independent of the regime type of a country, the regime's stability ought to matter to terrorism. As Piazza (2008) finds, political instability is conducive to terrorism. For instance, terrorists groups may find it easier to overthrow newly established (i.e., instable) political regimes due to their lack of popular support and trust. Regime stability is measured as the number of years since the most recent regime change, with data being drawn from the *POLITY IV Project*.

Government Size: Kirk (1983) argues that larger governments attract terrorist activity that is directed at capturing economic and political rents the government controls. These rents ought to increase with government size so that terrorism is also expected to increase with it. The size of the government is indicated by the (logged) *government component of the real GDP* from the *PENN World Table*.

[15] See also Caruso and Schneider (2011, section 2), who provide a discussion on the emergence of democracy and violence in some detail. They argue that countries which are democratizing experience an increase in violence for some time before it is reduced again.

[16] Alternatively, democracy and terrorism may be non-linearly linked. That is, autocratic regimes may use repression to oppress dissent, whereas established democracies may rely on non-violent conflict resolution through political participation. Then, semi-open polities ought to be most prone to terrorism because they can neither fully rely on repression or participation to resolve conflicts. We control for such non-linear linkages by including democracy and its square in one of the robustness specifications.

[17] See http://www.systemicpeace.org/polity/polity4.htm.

Population Size: A robust finding in the empirical analysis of the roots of terrorism is that terrorist activity is more likely in populous countries (Krieger and Meierrieks, 2011). Here, the absolute number of terrorist incidents ought to be higher when the population in absolute terms is bigger. Also, a large population may reflect demographic stress (e.g., from ethnic tensions) and higher policing costs for the government, where such factors are also expected to make terrorism more likely. The (logged) *population size* is extracted from the *PENN World Table*.

Civil War: As noted by Merari (1993), insurgent groups may use terrorist tactics in the cities, while resorting to open guerilla warfare in less protected regions of a country at the same time. Thus, terrorist activity is expected to be more likely in countries during civil wars. This is also consistent with the idea that political instability is conducive to terrorism (Piazza 2008). We use the *UCDP/PRIO Armed Conflict Dataset* to indicate incidences of civil war through a *dummy variable* (1=incidence of civil war with at least 1000 battle deaths per year).[18]

Religion: In some specifications we also assess the influence of religion on terrorism. Intuitively, religious conflict is expected to be positively related to terrorism. For instance, conflicts over scarce resources may be fought along religious lines, with terrorist groups using religious differences to muster support (cf. Bernholz, 2004). We indicate the impact of religion on terrorism through a country's degree of *religious fractionalization*. We also assess whether Islamic countries are particularly prone to terrorism by controlling for the (logged) *percentage of Muslims* in a country to factor in the prominent role Islamism has played in religiously motivated terrorism in recent years (e.g., Bernholz, 2004). Both data series are extracted from the replication data of Fearon and Laitin (2003).

International War: As a robustness check, we also test whether international conflict between states makes terrorism more likely. For instance, such conflicts may attract terrorist activity 'imported' from the foreign enemy's country. We use the *UCDP/PRIO Armed Conflict Dataset* to indicate incidences of international conflict war through a *dummy variable* (1=involvement in international conflict).

Military Spending: Some recent contributions (Drakos and Giannakopoulos, 2009; Arin et al. 2010) have assessed the role of defence spending in terrorism, finding that high spending (as a proxy for counter-terrorism spending and effectiveness) is detrimental to terrorism. As another robustness test, we thus use data on (logged) *per capita military expenditures* from the *Correlates of War National Material Capabilities Dataset* to also account for the role of anti-terrorism policies in determining terrorist behavior.[19]

[18] See http://www.prio.no/CSCW/Datasets/Armed-Conflict/UCDP-PRIO.

4. Empirical results and discussion

Using the data described above, we run several specifications of our regression model in order to assess the influence of poor socio-economic conditions on the likelihood of terrorism on national levels. First, we run a baseline model specification that accounts for several proxies of socio-economic development and further political and demographic controls. This model includes data on the per capita income and its square, national levels of consumption, economic openness, investment and further political and demographic variables (population size, government size, democracy, regime stability and incidences of civil war). The results are reported in Table 1.

Table 1 shows that variables indicating a country's socio-economic situation are robustly associated with terrorist activity.[20] There is evidence that terrorism is (partially) rooted in poor socio-economic conditions. This contrasts with the empirical mainstream on the causes of terrorism. However, this finding is most likely a consequence of our focus on domestic and transnational terrorism at the same time (while previous studies have only focused on transnational terrorism). That is, our analysis is less likely to be biased by a focus on transnational terrorism only, which is likely to emphasize the role of political (e.g., foreign policy) over economic variables.

[19] See http://www.correlatesofwar.org/.

[20] Note that diagnostics for multicollinearity (e.g., the mean variance inflation factors) indicate that multicollinearity may be a problem due to the inclusion of the GDP per capita and its square in the same estimation. However, this inclusion is necessary to unveil non-linear linkages.

Table 1. Negative binomial estimates (baseline specifications)

	Model 1	Model 2	Model 3	Model 4	Model 5
GDP per capita $_{t-1}$	3.719	3.389	4.068	3.559	0.638
	(6.67)***	(6.04)***	(4.22)***	(7.01)***	(4.26)***
GDP per capita (sq.) $_{t-1}$	-0.204	-0.184	-0.209	-0.194	
	(6.21)***	(5.59)***	(3.62)***	(6.50)***	
Consumption $_{t-1}$	-0.408	-0.378	-0.612	-0.210	-0.461
	(2.86)***	(2.70)***	(2.84)***	(1.63)	(2.20)**
Trade Openness $_{t-1}$	-0.246	-0.193	-0.222	-0.252	-0.253
	(3.53)***	(2.79)***	(1.93)*	(4.64)***	(2.21)**
Investment $_{t-1}$	-0.224	-0.214	-0.233	-0.272	-0.228
	(3.68)***	(3.55)***	(2.67)***	(4.71)***	(2.63)***
Population Size $_{t-1}$	0.125	0.130	1.998	0.086	2.576
	(3.92)***	(4.08)***	(6.61)***	(3.16)***	(9.92)***
Government Size $_{t-1}$	0.259	0.279	0.387	0.389	0.492
	(3.23)***	(3.54)***	(3.20)***	(5.18)***	(4.28)***
Democracy $_{t-1}$	0.030	0.024	0.012	0.030	0.013
	(6.18)***	(4.96)***	(1.97)**	(6.81)***	(2.12)**
Regime Stability $_{t-1}$	-0.006	-0.007	-0.012	-0.007	-0.012
	(4.19)**	(4.86)***	(4.33)***	(4.90)***	(4.18)***
Civil War $_{t-1}$	0.829	0.470	0.602	0.957	0.603
	(10.67)**	(5.90)***	(6.83)***	(11.79)**	(6.87)***
Terrorist Attacks $_{t-1}$ *		0.003	*		
		(14.37)**			
	*				
Time Effects	Yes	Yes	Yes	No	Yes
Regional Dummies	Yes	Yes	No	Yes	No
Country-Fixed Effects	No	No	Yes	No	Yes
Wald χ^2 (Prob> χ^2)	0.000***	0.000***	0.000***	0.000***	0.000***
Sample Size	3956	3956	3956	3956	3956

Note: Dependent variable is the number of terror incidents within a country per year; absolute *t*-statistics reported in parentheses; constant not reported; significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively.

In detail, we find that higher levels of consumption, trade openness and investment (all of which indicate good socio-economic conditions) are almost always negatively correlated with terrorist activity in statistically robust ways. High levels of consumption and investment seem to be necessary to increase the opportunity costs of terrorism, e.g., by fostering growth, entrepreneurship and socio-economic satisfaction. With respect to trade openness, our finding indicates that economic globalization is not seen as a threat – as hypothesized by Wintrobe (2006b) – but rather as an opportunity for economic gains, e.g., as economic integration indirectly reduces the propensity for violence by yielding trade gains. Our finding is consistent with Blomberg and Hess (2008) and Kurrild-Klitgaard, Justesen and Klemmensen (2006) who also detect a negative correlation between trade openness and terrorism production.

With respect to the effect of per capita income, we find that it is non-linearly related to terrorism. That is, only after a certain threshold of income is reached, we find that income is negatively related to terrorism (corresponding to a wealth effect). When we let income enter only in a non-squared form (Model 5), we find a positive association between the per capita income and terrorism. This is very similar to Lai (2007) who also documents a positive effect of income on terrorism production in a simple specification, while finding a non-linear relationship when using a quadratic specification. He argues that a quadratic term better represents the production of terrorism in countries that are in intermediate development positions. In such countries the terrorism opportunity costs may generally favor its generation. On the one hand, income is not high enough to discourage terror. On the other hand, due to poor institutions and few policy resources such countries may be incapable of solving social conflict (so that terrorism prevails), while nevertheless being strong enough to prevent open rebellions (i.e., civil wars) from happening.

Table 1 also reports some robustness checks with respect to our baseline specification. In detail, we include and exclude regional and time dummies and country-specific effects. We also include a lagged dependent variable. The results of the baseline model (Model 1) are generally robust to these alterations (Models 2 to 5). The positive effect of the lagged terrorism variable suggests path dependence as in, e.g., Enders and Sandler (2005) and Lai (2007). For instance, longer terrorist campaigns ought to generate more media attention, thereby making such a strategy more attractive.

With respect to the additional controls, we find that terrorism is more likely in populous, democratic countries that are political instable and have a large government. Overall, these findings match the empirical mainstream, as summed up by Krieger and Meierrieks (2011). In detail, our finding on population size fit the general consensus that demographic stress is linked to increases in terror (e.g., Burgoon, 2006; Lai, 2007). Also, it confirms the assumption that terrorism (in absolute numbers) ought to be more likely when populations are large. Our findings regarding a positive effect of democracy on terrorism may reflect a reporting bias (as discussed above). However, this finding may also indicate an increased vulnerability of democracies to terrorism due to their protection of civil liberties that makes terrorism less costly. Unsurprisingly, the stability variables (regime stability and civil war) indicate that terrorist activity becomes more likely during instable times, as argued by Piazza (2008). For instance, terrorist groups are less likely to be challenged by newly established (weak) governments or when countries are plagued by severe internal conflict, during which political vacuums are more likely to be created (and filled by terrorist groups). Finally, the positive association between government size and terrorism supports the hypothesis of Kirk (1983). That is, large governments seem to signal high economic and political rents that incite terrorist activity directed at capturing these rents.

To further assess the robustness of our empirical findings, we amend our baseline specification with further explanatory variables (as discussed above). The findings are reported in Table 2.[21]

Overall, our statistical findings survive the inclusion of further explanatory variables. That is, we again find that low levels of consumption, economic openness and investment are conducive to terrorist activity. A positive (i.e., dampening) impact of a high level of per capita income on terrorism only emerges after a threshold of economic development has been reached. As before, we thus find that a country's level of socio-economic development matters to the calculus of terrorists, presumably due to its effect on the opportunity costs of terrorism. In line with our theoretical reminder presented in Section 2, low opportunity costs of terrorism make terrorism more likely. That is, the mental rewards from terrorism (e.g., solidarity or status that accompanies the success of terrorists' ideology) become more attractive. Conversely, with the improvement of socio-economic conditions (e.g., economic participation, employment and material goods consumption) non-violence becomes more attractive, so that terrorism decreases. This idea is also supported by the finding that economic growth is negatively related to terrorism (Model 1). As argued by Blomberg, Hess and Weerapana (2004), in good economic times terrorism becomes less likely because other means of economic participation and consumption are offered (i.e., because the opportunity costs of terrorism increase).

[21] Note that the results reported in Table 2 are generally robust to the exclusion or inclusion of time and regional dummies, country-specific effects and a lagged dependent variable. Due to space constraints, however, we only present assorted findings in Table 2.

Table 2. Negative binomial estimates (robustness checks)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
GDP per capita $_{t-1}$	4.254	3.877	3.763	3.727	3.733	3.157
	(4.40)**	(6.96)***	(6.72)***	(6.69)***	(6.72)***	(3.03)***
GDP per capita (sq.) $_{t-1}$	* -0.220	-0.213	-0.205	-0.204	-0.202	-0.149
	(3.79)**	(6.49)***	(6.23)***	(6.23)***	(6.19)***	(2.36)**
Consumption $_{t-1}$	-0.389	-0.378	-0.405	-0.438	-0.542	
	*	(2.72)***	(2.61)***	(2.84)***	(3.06)***	(2.38)**
Trade Openness $_{t-1}$	-0.643	-0.235	-0.265	-0.247	-0.182	-0.227
	(2.99)**	(3.36)***	(3.72)***	(3.54)***	(2.59)***	(1.93)*
Investment $_{t-1}$	* -0.222	-0.182	-0.209	-0.223	-0.244	-0.241
	(1.93)*	(2.92)***	(3.38)***	(3.67)***	(4.00)***	(2.69)***
Population Size $_{t-1}$	0.142	0.112	0.127	0.131	2.100	
	-0.213	(4.43)***	(3.64)***	(3.99)***	(4.10)***	(6.89)***
Government Size $_{t-1}$	(2.43)**	0.261	0.274	0.264	0.298	0.415
	1.993	(3.26)***	(3.38)***	(3.28)***	(3.68)***	(3.36)***
Democracy $_{t-1}$	(6.59)**	0.029	0.031	0.030	0.037	0.011
	*	(5.79)***	(6.22)***	(6.19)***	(7.29)***	(1.65)*
Regime Stability $_{t-1}$	0.358	-0.007	-0.006	-0.006	-0.004	-0.010
	(2.93)**	(4.68)***	(4.20)***	(4.17)***	(3.09)***	(3.66)***
Civil War $_{t-1}$	* 0.013	0.818	0.822	0.830	0.770	0.590
	(2.00)**	(10.51)**	(10.53)**	(10.71)**	(9.97)***	(6.68)***
Economic Growth $_{t-1}$	* -0.012	*	*			
	(4.25)**					
Rel. Fractionalization	* 0.596	0.672				
	(6.78)**	(3.46)***				
Muslim Population	0.048					
	*	(1.31)				
International Conflict $_{t-1}$	-0.008		-0.102			
	(2.03)**		(1.08)	-0.007		
Democracy (sq.) $_{t-1}$				(7.32)***		
Military Spending p.c. $_{t-1}$						-0.928
						(2.57)**
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes
Regional Dummies	No	Yes	Yes	Yes	Yes	No
Country-Fixed Effects	Yes	No	No	No	No	Yes
Wald χ^2 (Prob> χ^2)	0.000**	0.000***	0.000***	0.000***	0.000***	0.000***
Sample Size	* 3956	3956	3956	3956	3956	3846

Note: Dependent variable is the number of terror incidents within a country per year; absolute *t*-statistics reported in parentheses; constant not reported; significance at the 1%, 5% and 10% levels is indicated by ***, ** and *, respectively.

The findings for the standard control variables are also very much in line with those reported in Table 1. With respect to the additional controls, we find that religious

fractionalization is conducive to terrorism, e.g., as it may indicate religiously motivated conflicts over scarce resources (Model 2). However, Muslim countries are not particularly prone to terrorist activity (Model 3). Incidences of international conflict also do not matter to the level of terrorism in a country in a statistically robust way (Model 4). Including a quadratic democracy term and detecting a significant negative effect (Model 5) indicates that countries that are politically semi-open are most vulnerable to terrorism. This finding is consistent with, e.g., Abadie (2006) and Kurrild-Klitgaard et al. (2006). That is, the positive relationship between democracy and terrorism reported before may indeed be (partially) attributed to a reporting bias, as argued by Li (2005) and Drakos and Gofas (2006). Consistent with Drakos and Giannakopoulos (2009) and Arin et al. (2010) there is also a statistically robust negative association between per capita military spending and terrorism (Model 6). That is, anti-terrorism activities reduce the attractiveness of terrorism, potentially by raising its direct costs (e.g., increased likelihood of capture and punishment). The latter finding indicates that (in addition to means of socio-economic development) terrorism may also be fought by means of politico-military repression.

We also run a series of further robustness checks (not reported). First, we introduce another set of explanatory variables suggested by Fearon and Laitin (2003) in their analyses of the determinants of civil war onset. Controlling for resource endowments (oil production), rough terrain and non-contiguity, we do not find that the effect of poor socio-economic development on terrorism vanishes. Second, we run our baseline model (Table 1) using other empirical techniques, namely a panel negative binomial regression with conditional fixed effects and an OLS regression with panel corrected standard errors. However, we do not find systematic and qualitative changes to our main findings reported in Table 1. That is, our main findings are also robust to the inclusion of a further set of controls and the use of alternative statistical models.

5. Conclusion

Is terrorism predominantly rooted in unfavorable political and demographic conditions? The empirical mainstream on the determinants of terrorism suggests that this is indeed the case. This contribution offered a stylized theoretical reminder, which suggests that socio-economic conditions also ought to matter to the emergence of terrorism. Arguing with the opportunity costs of terrorism, we were able to show that these very opportunity costs (which are also reflected in country-specific socio-economic conditions) may influence the calculus of terrorists and their supporters. That is, we provided a theoretical channel from poor socio-economic conditions (via the opportunity costs of violence) to the genesis of terrorism. We then presented an empirical analysis to check the validity of our theoretical reasoning. As a major innovation, we used data on domestic and transnational terrorism for 110 countries between 1971 and 2007, so as to not run the risk of arriving at misleading results due to a sole focus on the phenomenon of transnational terrorism (on which the empirical mainstream has overly focused). As our main result and consistent with our expectations, we found that poor

socio-economic conditions are indeed conducive to terrorist activity, controlling for a set of political and demographic variables.

Terrorism may be fought by hard or soft measures, i.e., by the use of 'the stick' or 'the carrot' (Frey, 2004). The results of our study allow for some modest policy conclusions. The negative correlation between terror and socio-economic variables suggests that governments ought to counter terrorism not exclusively by relying on the 'stick', even though related policy means (e.g., investments in the security apparatus) may also pay off. Rather, our findings also suggest using the 'carrot', i.e., favoring policy means that influence the opportunity costs of terror in ways that reduce violence, at least in the medium and long run. Such an approach is in line with the suggestions of, e.g., Frey and Luechinger (2003) and Frey (2004).

In more detail, we can propose three policy options along these lines. First, our findings suggest that improvements in a country's socio-economic situation (e.g., better economic performance, increased economic integration) can help to increase the opportunity cost of terrorism and thus make terrorism less likely. Policies that foster growth, investment and economic participation may therefore also yield a dividend in terms of a reduction in terrorism. The sooner countries get rich, the better are the prospects of a peaceful future. Regarding the effect of openness on terrorism, this result is also perfectly in line with what trade theory and the empirical evidence on the role of trade in development suggest. Second, it may therefore be helpful to guide trade policy in the US and the EU towards the developing world taking into account this perspective. Third (as a further indirect implication), overcoming the institutional trap seems important to foster global economic success, which in turn is expected to help in the fight against terrorism.

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Appendix A. Descriptive statistics

	N*T	Mean	Std. Dev.	Min	Max
Terrorist Attacks	4070	17.64	59.91	0	711
GDP p.c.(logged)	4070	8.55	1.13	5.74	11.49
Consumption (logged)	4070	4.13	0.33	1.62	5.25
Trade Openness (logged)	4070	4.03	0.62	0.84	6.12
Investment (logged)	4068	2.82	0.68	-0.13	4.39
Population Size (logged)	4070	9.28	1.49	6.15	14.09
Government Size (logged)	4070	2.74	0.47	0.36	4.22
Democracy	4068	1.36	7.58	-10	10
Regime Stability	4070	25.49	30.18	0	198
Incidence of Civil War	4070	0.04	0.21	0	1
Economic Growth	4070	1.84	6.03	-41.11	58.11
Religious Fractionalization	4070	0.37	0.22	0	0.78
Muslim Population (logged+1)	4070	1.84	1.78	0	4.62
Incidence of Transnational War	4070	0.04	0.19	0	1
Military Spending p.c. (logged +1)	3953	0.12	0.18	0	1.26

Appendix B. Table of countries

Albania	Congo (Zaire)	Guyana	Malawi	Philippines	Trinidad
Algeria	Costa Rica	Haiti	Malaysia	Poland	Tunisia
Argentina	Cuba	Honduras	Mali	Portugal	Turkey
Australia	Cyprus	Hungary	Mauritania	Romania	Uganda
Austria	Denmark	India	Mauritius	Rwanda	UK
Belgium	Dom. Republic	Indonesia	Mexico	Saudi Arabia	USA
Benin	Ecuador	Iran	Mongolia	Senegal	Uruguay
Bolivia	Egypt	Ireland	Morocco	Singapore	Venezuela
Botswana	El Salvador	Israel	Nepal	South Africa	Vietnam
Brazil	Ethiopia	Italy	Netherlands	South Korea	Zambia
Bulgaria	Fiji	Ivory Coast	N. Zealand	Spain	
Burkina Faso	Finland	Jamaica	Nicaragua	Sri Lanka	
Cameroon	France	Japan	Niger	Sudan	
Canada	Gabon	Jordan	Nigeria	Swaziland	
CA Republic	Gambia	Kenya	Norway	Sweden	
Chad	Germany	Kuwait	Oman	Switzerland	
Chile	Ghana	Laos	Pakistan	Syria	
China	Greece	Lesotho	Panama	Tanzania	
Colombia	Guatemala	Libya	Paraguay	Thailand	
Congo (Republic)	Guinea	Madagascar	Peru	Togo	

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