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AL QAEDA AND JIHADIST TERRORISM IN THE LIGHT OF CONTEST THEORY

A THEORETICAL NOTE AND EMPIRICAL EVIDENCE OVER THE PERIOD 2004-2008

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Abstract: *This paper finds an empirical evidence that al Qaeda behaves as a contest organizer rewarding a prize to candidate extremist groups. Would-be terrorists must then compete with each other to prove their commitment and ability. Hence to maximize their own probability of winning the prize, each group (maximizes its effort). In particular, in the presence of costless information each candidate group can observe the results of attacks of other groups. Therefore, each group tries to make attacks at least equally destructive as the foregoing attacks. The testable implication is that: the number of victims of terrorist attacks is associated with the number of victims of past attacks. Resulting evidence confirms the hypothesis. However, results show that al Qaeda-style jihadist terrorist activity depends also upon grievance for poverty and socio-economic conditions.*

Keywords: Terrorism, al Qaeda, Contest Theory, Tournament, Information.

JEL CODES: D72, D74, J49, D8, D62, H4.

Introduction

Recent studies focus on determinants of terrorism activities. From a first point of view, some scholars emphasize the socio-economic roots of terrorism. This recalls the classical economic concept of opportunity cost. That is, the higher are the gains of an individual from participating in an ordinary productive activity the less he or she is willing to be engaged in terrorist activities. Therefore, better socio-economic scenarios would reduce the likelihood of terrorism. Moreover, would-be terrorists would be also motivated by grievance because of lack of civil liberties and existence of autocratic governments. This idea appears to be challenged by several studies which in the latest years expounded and tested the hypothesis that terrorist activity is positively related to the education and standard of living. That is, better educated individuals would become bloodier terrorists. In particular, since in poorest countries education and literacy levels are quite low, the productivity argument is also produced in order to rule out the opportunity cost argument.

Most existing works study terrorism by encompassing all the phenomena and events which have been defined 'terrorism'. This would be useful to draw some common or universal rules about its emergence and eventually about the design of an effective counterstrategy. Differently from several previous studies, the present work is not focused on terrorism in general. The work is focused on jihadist offspring of Al Qaeda. In particular, the study focuses on the plethora of would-be terrorist groups which emerged in the latest years. Such phenomenon has been also defined as 'Global Jihadism'. Shortly, in several countries, new terrorist groups emerged. These groups, may have not been formally part of al-Qaeda but they have espoused al-Qaeda's vision and strategy. In some case, they have been also effectively defined 'self starters', i.e. groups perpetrating terrorist attacks on their own initiative This kind of phenomenon has been occurring in the last few years, thanks to the peculiar organization of Al Qaeda which has been defined as a 'network' or a 'movement', in order to highlight the nature of an entity less structured than traditional terrorist organisations. Therefore, assuming that the glue that binds the global 'jihadism' is ideological, this study analyses those terrorist events which must have been perpetrated by Sunni fundamentalists which

espouse a radical Wahhabi version of Islam. This also marks a clear-cut distinction between jihadist terrorism and other form of terrorism. In particular, even with other forms of Islamist terrorism. In fact, within Al Qaeda jihadist universe there is no room for Shia terrorism.

All these premises have notable implications for the analysis. The theory first. The paper espouses and tests a different and complementary theoretical approach. That is, al Qaeda-style terrorist activity is interpreted in the light of contest theory. In this view, al Qaeda may be portrayed as a contest organizer providing an indivisible prize to the best terrorist group. Hence, these candidate cells compete with each other trying to maximize the number of casualties. In the eyes of economists, agents – namely the would-be terrorist groups – play à la Nash and maximize their efforts. In particular, in the presence of costless information each group observes the results of some previous attacks. Hence in order to maximize its own probability of winning the prize, each group (while maximizing its effort) tries to make attacks at least equally destructive as the foregoing attacks perpetrated by competing groups.

Secondly, there are also some notable implications for empirical application. The sample selection has been based upon a selection of attacks which fit the Al Qaeda's *modus operandi* and ideology. Moreover, the sample includes countries where the Sunni radicalism of Al Qaeda emerged in the latest recent years. Not surprisingly, the composition of the sample is 'global'. South Asian, Central Asian, Caucasian, African as well as some European countries are included. At the same time, the sample does not include countries or regions as Israel, Gaza Strip, Lebanon or Iraq. In fact, in Israel, West Bank, Gaza and Lebanon, there is no need of a tournament to select a terrorist champion. Shortly, Palestinian terrorist organisations are well-established and have been lasting for years. In Iraq, the scenario is puzzled. First, many observers agree that resistance against U.S. military forces and terrorist activities must be disentangled. Moreover, the contextual rivalry between Shia and Sunni groups also makes the picture more complex. Finally, since the available data are not enough detailed Iraq has not been included.

In brief, all the foregoing points clearly make the analysis peculiar and focused on radical jihadist groups. The dependent variable of the empirical application, is the number of victims and not the incidence of terror in itself. In fact, the number of victims

proxies contextually the productivity as well as the incidence of terror. Following the interpretation in the light of contest theory, the testable implication is that *the number of victims of jihadist attacks is related to the number of victims of past attacks.* In order to verify such hypothesis, it is possible to regress the number of victims of attack on the number of victims of the previous attack in the same country. Resulting evidence confirms the hypothesis. However, results show that al Qaeda-style jihadist terrorist activity depends also upon grievance for poverty and socio-economic conditions.

The paper is structured as follows: in a first section a selected survey of recent contributions in empirical literature is presented. In a second section, a theoretical argument is expounded. In a third section, the empirical application is developed. Eventually, in the last section, results are summarised and some conclusions are presented.

A selected survey of empirical literature

Hereafter, we present a selected survey of empirical studies on the determinants of terrorism. A first argument in the recent literature refers to the classical economic argument of *opportunity cost*. That is, the larger is the set of economic opportunities for an individual the lower is the likelihood or the willingness for him to be involved in a terrorist activity. In simpler words, the higher is the level of well-being the lower is the probability of terrorist activity in some territories. Consequently, low-income and poorest countries would be the natural incubators of terrorism. A second argument which can be defined as a *productivity argument* stresses the positive relationship between education and terrorist activity. That is, better educated individuals would also become more productive and bloodier terrorists. Among scholars, opportunity cost and productivity arguments are commonly cited as they would be opposite theories. In particular, since in poorest countries education and literacy levels are quite low, the productivity argument is also produced in order to rule out the opportunity cost argument. However, at a deeper reading, the two arguments are not necessarily on opposite sides. They can complement each other. In fact, the opportunity cost argument could determine the '*why'* whereas the productivity argument can determine the '*how*'. In addition, the opportunity cost argument is often complemented by a focus on

institutional and political atmosphere where terrorist activities take place. In non-democratic countries, the lack of opportunities for political participation induces political grievances, fuelling terrorism. Hence, in many studies a linkage between democracy and terrorism is often investigated.

In recent years, a well-known study is Krueger and Maleckova (2003) which is often quoted as showing in a cross-country regression that a negative relationship between GDP per capita and number of international terrorist events is statistically insignificant and very weak. At a deeper reading, however, there is no evidence whatsoever in this respect. In fact, the authors – with a special focus on Israel - first estimate the likelihood that someone can become a Hizbollah affiliate. By means of a logistic estimation, the authors show that a higher level of education is positively associated with the likelihood of becoming a Hizbollah militant. Eventually, the authors have estimated negative binomial regression models, where the dependent variable is the number of international terrorist events – defined as attacks involving citizens or the territory of more than one country. As noted above, albeit widely quoted by many other studies the study is not conclusive given that most coefficients are statistically insignificant. The main and more robust finding shows that terrorists are more likely to originate from larger countries. This really does not seem to be a surprising result. The only other significant estimation shows that terrorists come from poorest countries (that is, the countries falling within the bottom quartile of world distribution of GDP per capita). However, it is significant in only one out of four regressions. Blomberg at al. (2004) using the ITERATE database, analyse a panel of 127 countries over the period 1968-1991. By means of a bivariate Markov process, the authors investigate whether or not there is a relationship between emergence of terrorism and the state of a country's economy. Results show that periods of economic contractions increase the likelihood of terrorist activities. This result appears to be more robust for high-income and democratic countries. Such a relationship is studied in Li (2005) which analyzes the incidence of terrorist events in 11 countries over the period 1975-1997 and stresses the negative association between terrorism and democracy. The dependent variable is the annual number of transnational terrorist events that occur in a country whereas the explanatory variables are a bundle of political variables and few some economic factors as economic inequality and GDP per capita. The econometric estimation is a negative

binomial regression. The main results of the study show that democracy and terrorism are negatively associated. Such association is robust and statistically significant. Instead a negative association between terrorism and GDP per capita is only weakly significant.

Piazza (2006) also does not find any significant relationship between economic development and terrorism. In particular, this study employs alternatively as dependent variables the incidence of terrorist attacks and casualty rates. The data spans from the 1986 to 2002. The independent variables used in the analysis include a set of economic variables (HDI, GINI coefficient, GDP growth, inflation, unemployment), demographic variables (population and population growth, ethnic diversity), and political variables (number of parties, index of political repression). The results show that none of economic variables exhibits a significant association with both the incidence and the casualty rate of terrorist activity. Abadie (2006) uses country level data for 2003-2004 and shows that an increase in per capita GDP is associated with a reduction of terrorism, even if after controlling for other country characteristics national income is no longer associated with terrorism. That is, the analysis does not seem particularly robust. In particular, in the most conclusive OLS regression with 154 observations, the author shows that incidence of terrorism and GDP per capita are negatively associated, whereas the effect of political freedom is remarkably non-linear. In fact, the lack of political rights variable squared shows a negative and significant association with the incidence of terrorism is spite of a weakly significant positive association in the absence of the power squared exponent. Eventually, instrumental variables estimates confirm the qualitative results of OLS regressions.

Berrebi (2007) and Benmelech and Berrebi (2007) with a specific focus on suicide attacks in Israel show that that both higher education and standard of living are positively associated with the incidence of suicide attacks. They produce a productivity argument. In short, better educated people would more productive terrorist, i.e. able to spread more terror by killing more people. In the first paper, both higher education and standard of living appear to be positively associated with membership in terror organizations such as Hamas or PIJ and with becoming a suicide bomber. The empirical analysis is ran by mean of a logistic regression where the dependent variable equals 1 if the individual is member of Hamas or Palestinian Islamic Jihad (PIJ) and 0 otherwise. In the latter paper, the authors use a sample of 148 suicide attacks which represents 89

percent of the total number of suicide attacks between September 2000 and August 2005. The dependent variable is the number of people killed or injured in suicide attacks whereas the explanatory variables are given by age and education of suicide bombers and importance of target. In separate regressions, using a sub-sample of successful incidents (which reduces to the number of observations to 106) the authors show how the interaction terms (Age of suicide terrorist×Target) and (Education×Target) are positive and significant for the number of people killed. In their interpretation, older and better educated suicide bombers, when assigned to more important targets, are more effective killers. Perhaps, the main shortcoming of the study is given by the econometric estimation. In fact, since the dependent variable is event count the OLS estimators may be inconsistent. A recent study also focused on Palestinian suicide bombers is Sayre (2009) which studies the relationship between Palestinian suicide bombings and the labour market conditions as well as other political factors over the period 1993-2004. In the empirical model – estimated by means of a negative binomial regression – the dependent variable is the number of suicide bombings per quarter originating from a particular Palestinian sub-district and the explanatory variables are: (a) the mean daily wage; (b) the rate of unemployment and (c) the occurrence of some important political event. Results show that the frequency of terrorist events is positively associated with a deteriorating economy. In short, it is in line with the opportunity cost argument.

Freytag et al. (2008), present mixed results either confirming or contrasting the idea that terrorism is negatively associated with better socio-economic conditions. The analysis covers the period 1971-2005. The dependent variable is constructed as the number of terror incidents originating from a country during a five years span (ex. 1971-1975). The explanatory variables are clustered into three groups. (i) economic variables as – among others - GDP per capita, investment and trade openness; (ii) population characteristics as size and level of education; (iii) country specific effects related to institutional quality. The empirical findings show interesting evidence. Surprisingly, the impact of GDP per capita on terror is significantly positive (except for European countries) in simple form whereas the association turns to be significantly negative when GDP per capita is in quadratic form. The association between investment and terrorism is significantly negative with the exception of Islamic countries which show a positive association. Yet, human capital seems to be negatively associated

terrorism with the exception of Islamic countries. The authors interpret such evidence as there is a significant threshold of development. As long as this threshold is not surpassed, better economic performance encourages terror. Instead, as the threshold is surpassed the usual interpretation of opportunity costs holds.

The present work is significantly different from previous studies. First, the empirical analysis is based upon a selection of attacks which fit the Al Qaeda style. This makes the analysis peculiar and focused on radical jihadist groups. That is, it cannot be compared with foregoing studies which did not disentangle behaviour of Al Qaeda cells from the complex and heterogeneous universe of terrorism. Secondly the dependent variable is the number of casualties and not the incidence of terror in itself. In fact, the number of victims proxies contextually the productivity as well as the incidence of terror.

Al Qaeda in the light of contest theory.

In Caruso and Locatelli (2004/2008) a novel theoretical interpretation of al Qaeda-style terrorist behaviour has been proposed. Shortly, al Qaeda-style terrorist activity has been analysed in the light of contest theory. A contest is commonly defined as a game in which players compete for a prize by making irreversible outlays. In other words, contests are situations in which rational agents spend resources in order to win a prize. The characteristic feature of this interaction is that resources are spent irreversibly[1]. In this view, al Qaeda may be portrayed as a contest organizer providing an indivisible prize to the best terrorist group. Bin Laden and his fellows may start a competition among different would-be terrorist groups which are only loosely related to terrorist network. The prize could be assumed to be a honourable membership as well as an economic reward[2]. Hence, these candidate cells compete with each other. Agents – namely the would-be terrorist groups – play à la Nash and maximize their efforts. In

[1] Traditional contest models are formally grounded on Tullock (1980), and found seminal explanations in O'Keeffe, Viscusi, Zeckhauser (1984); Rosen (1986); Dixit (1987). Recent excellent contributions are Moldovanu and Sela (2001) and Moldovanu et al. (2007). A comprehensive and recent study on contest theory is Konrad (2009).

[2] It is established that al Qaeda has given grants to local groups that devised promising plans for attacks.

particular, all candidate groups may believe to be involved in a contest made by multiple rounds. How such interpretation could be defended?

It has always been a wide knowledge that al Qaeda does not retain a clear hierarchical line of command. In particular, this flexibility allows for a novel recruitment system. That is, In fact, even some recent work suggests that the recruiting process may now resemble a kind of voluntary application to join the organization[3]. In this view, new groups are involved in the organization as the result of a selection process amongst different volunteers (Sageman, 2004). The rise of the so-called "self starters" is taken as evidence of this, i.e. groups with little or no affiliation with the network perpetrating terrorist attacks on their own initiative (Kirby 2007, Sageman, 2008). In particular, attacks in Instanbul (November 2003), Madrid (March 2004), London (twice in July 2005) seemed to confirm the emergence of such phenomenon. This allows al Qaeda to extend its membership almost infinitely, simply because new groups can be affiliated at any time without an institutionalized recruitment procedure. It has also at least two significant advantages for al Qaeda. Firstly, there is no need for bin Laden and his fellows to invest resources in any recruitment drives. Secondly, and most importantly, such an abundance of applications would allow al Qaeda to be very selective in granting membership.

As noted above, contests are situations in which rational agents spend irreversibly resources in order to win a prize. This does constitute the main difference with auctions, in which agents do not bear the cost of the bids entirely by themselves. This is also the rationale for labelling contests as all-pay auctions. Literature on contests implies the concept of non-cooperative Nash equilibrium. Simple examples of contests can be drawn form sports. In a race, athletes cannot coordinate their actions and in the presence of an indivisible prize (call this winner-take-all contest) they will put in their maximum effort to win the prize. The optimal level of the effort exerted by every agent is strictly correlated to the value of the 'prize' – i.e. the higher the evaluation of the 'prize', the higher the commitment to put the maximum effort into the contest will be. Second, each agent knows that the probability of winning the contest is increasing in its own effort and decreasing in other players' efforts. That is, in the simplest case of two agents, A and B, the probability of agent A of winning the contest is higher when it

[3] Cozzens (2005).

makes a bigger effort than agent B. Therefore, the only feasible strategy for both A and B will be exerting the maximum possible effort. In a multi-agent scenario, however, the theory also predicts that total effort decreases in the number of contestants. That is, when agents are aware that the contest is joined by more agents, individual effort will decrease.

Of course, these general predictions about agents' behaviour can be considered as *ceteris paribus* conditions. In general, these properties hold even when other factors impact the effectiveness of efforts. For expository reasons, we can say that it is possible to indicate two candidate subsets of interacting factors: (a) individual characteristics; (b) exogenous characteristics. As individual characteristics, consider first the existence of different talents and abilities. Individuals as well as groups differ widely in terms of abilities. The idea of ability is 'somehow' *technological.* If you consider that a contest can be considered nothing but a production function of a monetary reward, then the efforts do constitute the 'inputs', whilst the abilities do constitute a technology translating a certain level of efforts into the probability of success. The impact of different abilities is clearer in the presence of a winner-take-all contest. Take again the example of the race. Since athletes are expected to put their maximum effort into the race, and given that their level of effort depends upon the value of the prize, they would make the same effort. In such a case, the outcome of the contest will be determined – everything else being equal – by abilities. Of course, abilities can be exogenously given and refer to personal talents given by nature, but they can also be related to some specific positive investments made by agents. Still, whatever the case, this does not really matter while analysing a contest. If they are not able to update their own abilities at different stages of the game, their efforts will be fruitless.

Of course, the design of the contest matters. That is, the agent providing the 'prize' of the contest can somehow modify the architecture of the contest in order to influence the total effort exerted. The simplest case is that of providing different prizes. This is commonly the case with sport contests where prizes are offered for the winner but also for the runner-up. Moldovanu and Sela (2001) offer a brilliant theoretical contribution in this respect. They show that in the presence of concave cost functions, only one prize is the optimal design which does maximize efforts. By contrast, in the presence of convex cost functions, different prizes may constitute an optimal design. In

fact, even if agents are aware that they cannot win the contest, they also expend the maximum effort to get the other prizes. This is the case in sports such as cycling, where different prizes are provided by organizers and then the total efforts of participants is maximized. By contrast, when the cost function is not convex only one prize leads to the best design. In such a case, the designer's objective is also maintained. The level of total effort is maximized. Offering only one prize guarantees that no player will give up. This is true in particular when players do not have information about other contestants' abilities.

A crucial point is represented by information. The simplest case refers to asymmetry in the evaluation of the prize. That is, without any public disclosure of information, agents can evaluate the 'prize' of a contest differently. Since the level of effort is positively correlated to the value of the prize, different evaluations of the stake lead to different levels of effort made by agents. Nti (1999) analyses the case of a contest where participants evaluate the 'prize' differently. The common result of this analysis is that agents that evaluate the stakes more highly make a bigger effort in the contest than low-evaluation participants. Hillman and Riley (1989) show that asymmetric evaluation deters participation by low-evaluation agents. Consider a contest with only two players, A and B, with identical abilities. If A retains a higher evaluation of the prize, it will exert itself more, and as a consequence will be the favorite. Agent B, the 'Underdog', will exert itself less. Therefore, increasing the favourite's valuation increases its effort, but decreases the effort of the underdog. This result may hold even if Agent B (the low-evaluation agent) has superior abilities.

Another crucial piece of information which is not publicly available is the number of contestants. Namely, participants do not know (at least not exactly) the number of contestants. As noted in Munster (2006) this also increases the total level of efforts exerted. Eventually, all the participants are privately informed about their abilities – in other words, each groups knows how much it can achieve, but is unaware of the others' potential. This, in turn, creates a favourable condition for the contest designer, since all groups are forced to give their best and maximize their efforts. In fact, in the first round of the tournament the competing groups can signal their commitment and ability. Therefore, this also increases the level of efforts exerted. This is modelled in Amegashie (2006) and Amegashie et al. (2006) that analyses elimination

contests where all players do not save efforts in the first stage in order to signal their own ability to the other contestants.

This introduces a proper and necessary distinction between contests and tournaments. In fact, a tournament is nothing but a multi-stage contest. However, it has some implications with respect the availability of information. As expounded by Morgan and Vardy (2007), in a sequential tournament, it is the effectiveness of the first-movers effort that is revealed to the second mover, rather than the effort itself. That is, the second long jumper gets to observe the distance jumped by the first, but not the underlying effort that produced the jump. By contrast, in a sequential contest it is effort that is observable, while its ultimate effectiveness remains unobservable until the very end of the contest. In our context, the second terrorist candidate observes the outcome of the first terrorist candidate. This is quite simple. Once the efforts are exerted information becomes costless. When it comes to terrorist attacks, monitoring and information costs are close to zero: in fact, when a terrorist group bombs an embassy or a trade centre with dozens of casualties somewhere in the world, the event is extensively covered by international mass media[4]. In the presence of costless information acquisition, it is also possible to recall Dixit (1987) that points out that modelling difference between contests and tournaments has no sense when observation is costless. In the presence of costless information there is no difference between a contest and a tournament. Therefore, players could not save efforts and resources in different stages, they have to maximize efforts. Hereafter, given the costless information emerging after a terrorist attack, equivalence between contest and tournament can be assumed in our context.

Testable Implications and empirical strategy.

As noted earlier, in the presence of costless information there is no need of distinguishing between contest and tournament. Therefore, henceforth the terms 'contest' and 'tournament' will be used alternatively. Let us consider the jihadist tournament. Within this context, let us assume that each group – before perpetrating its

[4] In a recent article Rohner and Frey (2007) demonstrated empirically that media attention and terrorism do mutually Granger cause each other.

own attack – observes the results of some previous attacks. Hence in order to maximize its own probability of winning the prize, each group (maximizes its effort) tries to make attacks at least equally destructive as the foregoing attacks. Simply, the testable implication is that: *the number of victims of jihadist attacks is related to the number of victims of past attacks.* In order to verify such hypothesis, it is possible to regress the number of victims of attack on the number of victims of the previous attack in the same country.

The implicit limiting assumption is that if a tournament takes shape, it does at a national level. In such a way, the feasible interpretation is that al Qaeda would work in order to organise some 'national' champions. Perhaps, even if this is a conjecture, it is also possible that some terrorist groups behave spontaneously as they were in a national contest. In such a case, the usual distinction between domestic and transnational terrorism loses its explanatory significance. However, a simple evidence seems to support this hypothesis. Figure 1 and Figure 2 report the terrorist incidents in Philippines and Russian Federation respectively. By analysing the figures it seems that terrorist waves somehow took place in both countries. In particular, it seems that in a country in a relatively short period a number of attacks has been perpetrated. You can see in the graphs. At a first view, in some case, it seems that there are some periods where incidents became more frequent. That is, it seems that there is a wave of attacks. Perhaps, in those periods perhaps a contest (a tournament) takes place. At least, this suggests an association between attacks (or at least between a subset of them). This is particularly interesting when different groups claimed responsibility for different attacks.

Take Philippines. On 12 December 2004, in General Santos City, an improvised explosive device (henceforth IED for sake of brevity) exploded in a public market, killing 17 civilians, wounding 70 others. No group claimed responsibility. The day after, on 13 December 2004, in General Santos City, a bomb exploded in the meat section of a public market, killing 15 civilians and wounding 58 others. Authorities concluded that Jemaah Islamiyah (JI) was responsible. Some weeks after, the terrorist wave continued in bloodier and more effective terms. On 14 February 2005there were three coordinated attacks which have been therefore defined "Valentine's Day" bombings. At 6.30 pm, in General Santos City, a bomb hidden at a taxi stand outside the

Gaisano Mall entrance exploded, killing five civilians and wounding 33 others. About 6:30 PM, in Davao City, a bomb exploded near the gate of a terminal killing one child and wounding nine civilians. At 7:34 PM, in the Makati business district of Manila, a bomb exploded on a bus approaching a bus terminal, killing six civilians, wounding 94 others. The Abu Sayyaf Group (ASG) claimed responsibility for the three coordinated bombings.

In Russian Federation on 24 August 2004, there were two near-simultaneous attacks against Russian airlines on this day. At 11:56 PM, a suicide bomber aboard a Sibir Airlines Tu-134 airplane, travelling from Moscow to Volgograd, detonated an explosive device in the lavatory, causing the plane to crash in the Tula Region, near the village of Buchalki, Russia, killing 44 people. At 11:59 PM, a suicide bomber aboard a Sibir Airlines Tu-154 airplane, travelling from Domodedovo airport Moscow to Sochi, detonated an explosive device in the lavatory, causing the plane to crash in Rostov-on-Don, village of Gluboky, Russia, killing 46 people. The Islambouli Brigades, Riyad us-Saliheyn Martyrs' Brigade, Chechen Affiliated Foreign Mujahidin claimed responsibility. On 31 August 2004, in Moscow, a female suicide bomber blew herself up at the Rizhskaya subway stop, killing nine civilians and wounding more than 50 others.

FIGURE 1. VICTIMS BY INCIDENT IN PHILIPPINES, 2004-2008, SOURCE: WITS

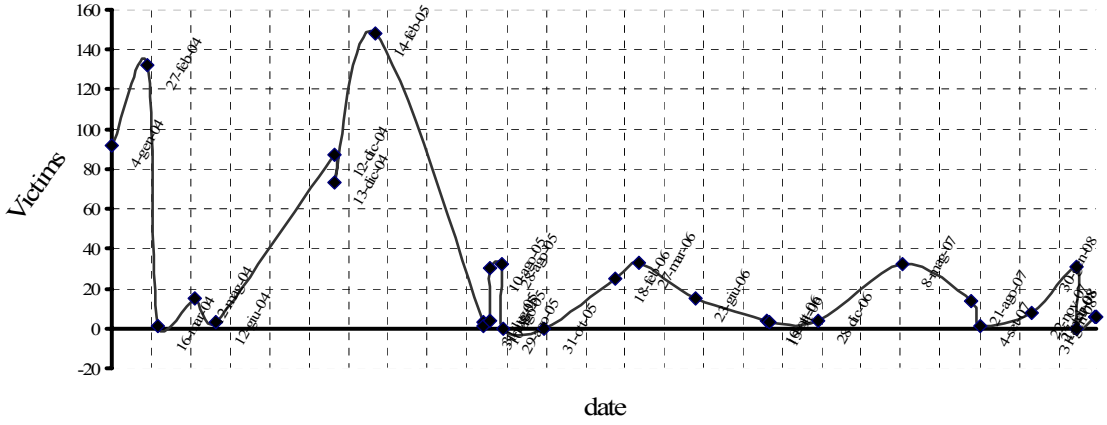
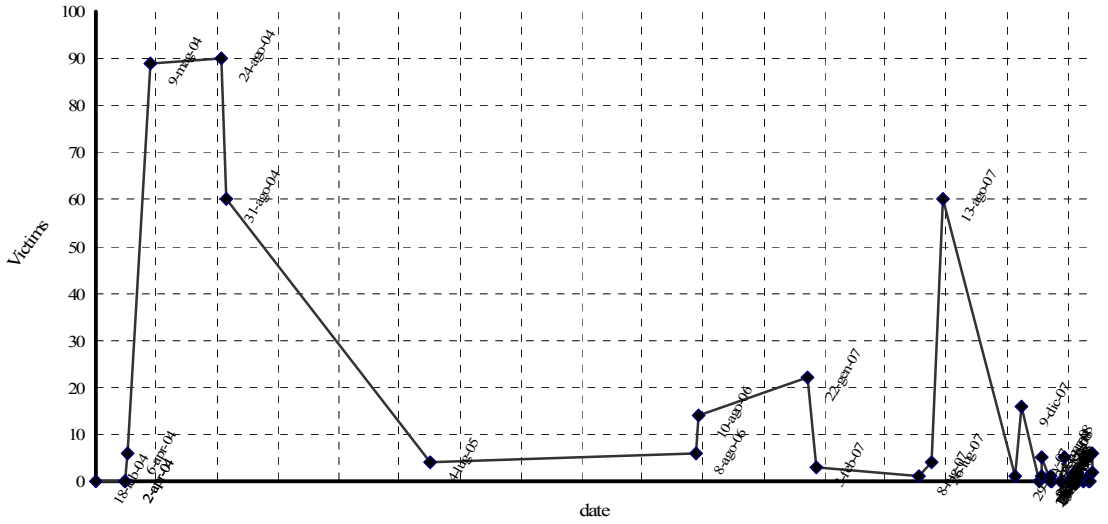


FIGURE 2 VICTIMS BY INCIDENT IN RUSSIAN FEDERATION, 2004-2008, SOURCE WITS



The dependent variable of the empirical analysis is the number of victims computed as the sum of deaths and injured people. The dependent variable is event count, and therefore ordinary least squares (OLS) estimates can be inconsistent and biased. The **negative binomial regression** is thus applied. In particular, the negative binomial regression has to be preferred because the data exhibit overdispersion. Data on terrorist incidents have been extracted from WITS Worldwide Incidents Tracking System, National Counterterrorism center[5]. The dataset is very detailed. Each record reports different characteristics of the incident. Then, it had been possible to filter the dataset in order to in order to consider only incidents fitting with al Qaeda's *modus operandi*. Therefore the records have been filtered according the following steps:

(1) each record had to report the Islamic extremist as perpetrator. In particular, the dataset collected three different types of Islamic extremism: (a) Sunni; (b) Shia; (c) unknown. As noted in the introduction, only (a) and (c) have been considered;
(2) Incidents occurred in Israel, Gaza Strip, West Bank, Iraq and Afghanistan have been excluded;
(3) Each incident had to involve explosive devices (in particular IED, Improvised explosive device);

[5] The dataset is downloable at the address http://wits.nctc.gov/Export.do (last access september 2008).

(4) Attacks to facilities have been excluded. For example, attacks to pipelines have been excluded;
(5) Assassinations of political leaders have been excluded even if an involvement of Islamist extremists has been reported;
(6) Attacks to shops, groceries and small business facilities have been excluded;
(7) Victims of coordinated attacks have been aggregated.

Once the data has been filtered the total number of observations reduced to 215. Eventually, the sample estimation covers 22 countries over the period January 2004 – March 2008. The sample includes countries where the Sunni radicalism of Al Qaeda emerged in the latest recent years. As explained in the introduction the sample does not include countries as Israel, Gaza Strip, Lebanon or Iraq. In fact, in Israel, West Bank, Gaza and Lebanon, there is no need of a tournament to select a national champion. National champions already do exist. Shortly, Palestinian terrorist organisations are well-established and have been lasting for years. In Lebanon, the Hezbollah has been founded in Lebanon in 1982. Hamas has been founded in 1978 and launched the Jihad against Israel in 1988. The Palestine Islamic Jihad (PIJ) has been formed by militant Palestinians in Gaza during the 1970s. Therefore, it is reasonable to assume that the theoretical approach of the tournaments does not apply to this scenario. First, Hamas, PIJ or Hezbollah do not need to be involved in any tournament. They are already the 'best teams'. In particular, it is widely known that these organizations have been continuously funded by different sources. Iraqi scenario is also puzzled. First, the main problem about Iraq is represented by available data. In many cases, no group claimed responsibility of attacks. Therefore, it is difficult to select the cases which could fit the model because the database does not report the necessary definitions. For example, many events could be alternatively attributed to both Sunni or Shia groups. Secondly, in Iraq, Al Qaeda operations have been led by Al Zarqawi. However, Al Zarqawi has been officially recruited by Al Qaeda in 2002. Even in this case, it seems that a jihadist tournament as a recruitment process did not take place. Third, moreover, in Iraq, resistance to U.S. occupation forces and terrorism should be disentangled. There is evidence that many attacks depend upon the presence of U.S. occupation forces (Blank et al., 2008).

Unfortunately, Somalia is the only critical country excluded from the sample. Somalia has been becoming a safe heaven for jihadists for the latest years. Unfortunately, there are no economic data about Somalia. Therefore, Somalia must have been excluded from the study.

TABLE 1 - COUNTRIES AND NUMBER OF INCIDENTS

Country	Number of Incidents	Number of victims
Algeria	46	1011
Bangladesh	15	432
Egypt	5	509
Eritrea	1	15
Ethiopia	1	9
France	1	10
India	37	2547
Indonesia	5	440
Iran	4	45
Jordan	1	175
Pakistan	23	1284
Philippines	27	803
Qatar	1	17
Russian Federation	23	1658
Saudi Arabia	4	185
Spain	1	2032
Syria	2	17
Thailand	11	105
Turkey	2	20
United Kingdom	2	754
Uzbekistan	3	50
Yemen	1	18
	216	12136

Therefore, we examine the main hypothesis of this work by using the following model:

$$Victims = \beta_1 Pastvict + \beta_i X + \varepsilon_i$$

The variable 'victims' is given by the sum of dead and wounded people. They can be victims of different groups' attacks. The variable *Past victims* is defined as the number of victims of the previous terrorist attack in the same country. Namely let y_{it} be the number of victims in country i at time t, where the latter is an exact date. Eventually past victims is therefore defined as y_{it-1}. However there is no common time lag. The time lag between t and $t-1$ can vary. For example in the Philippines On 4 January 2004, a bomb, exploded killing 22 people and injuring 71 others, including a mayor. The following incident took place few weeks after. On 27 February 2004, a bomb exploded killing 132 people. In such a case, it seems that two different groups acted. (Moro and ASG). The time lag can be shorter. On 8 february 2005, in Thailand a IED exploded wounding two civilians. After two days in the same province on 10 February another IED exploded wounding six security officers.

Data on GDP per capita have been extracted from the IMF World Economic Outlook. Data are derived by converting GDP in national currency to U.S. dollars and then dividing it by total population. The institutional regime has been captured through the polity index as developed in Polity IV project, Political Regime Characteristics and Transitions, 1800-2006. The Polity-Index (PI) was developed by Gurr in the 1970s. The actual polity-index is based on a subtraction of a value on the autocracy scale from a value on the democracy scale. Thus it results in values ranging from –10 (very autocratic) to +10 (very democratic).

It is widely acknowledged that the use of GDP (or alternatively GNP) as a measure of progress of nations is strongly criticised. In fact, it can be misleading. First, GDP per capita may measure the aggregate economic activity and not the social well-being. Second, the GDP measures only the current economic activity but says little about future economic scenario. Therefore, in order to evaluate more accurately social well-being in a broader context different measures can be used. A better index is the

Human Development Index (henceforth HDI for sake of brevity) produced by United Nations Development Programme (UNDP) since 1990. The HDI combines three basic dimensions of human life: (1) life expectancy at birth; (2) education; (3) standard of living measured by GDP per capita. Given its nature, it could be considered a good approximation of a broader socio-economic environment. The life expectancy at birth is the expected length of life of new-born individuals given the current mortality rates. Of the three components education is calculated as a combination of (a) adult literacy rate; (b) enrolment ratio for primary, secondary and tertiary education. By adult literacy, it is meant the proportion of the adult population (>15 yeas old) that are literate. Of course, education is a measure of human capital and it does constitute a stock. At the same time, it does also capture a future dimension of well-being.

Data on Urban population (denoted by Urban) have been also extracted from UNDP. Needless to say, the crowded towns are an attractive target for terrorists. CPI denotes the average annual change in consumer price index in 2004-2005 and it is also extracted from UNDP. The CPI proxies changes in purchasing power of individuals which can affect negatively the standard of living. It is particularly severe in some of the countries selected in our sample. For example, in Russian Federation, in 2004-2005 the consumer price index increased by 12.7%. In Indonesia it grew up by 10.5% in the same period and in the Philippines by 7.7%. The Gini index of income inequality has also been drawn form UNDP. Data on military expenditures (denoted by Milex) have been extracted from the SIPRI dataset and are expressed in constant (2005) millions of US$. They are military expenditures made by government. Military expenditures do not take into account foreign military presence. In fact, there are no accurate data about foreign soldiers. However, the latter point could have been misleading because some countries included in the sample do not host any foreign army. Table 1 summarises sources of data and descriptive statistics.

TABLE 2- VARIABLES, DESCRIPTIVE STATISTICS AND SOURCES

	Description	Source	Obs.	Mean	Std. Dev.	Min	Max
Victims	Victims of incidents (logged)	NCTC	215	2.445	1.681	0	7.62
PastVict	Victims of previous incident in the same country (logged)	NCTC	201	2.502	1.647	0	7.14
Gdppc	GDP per capita	IMF, WEO	215	7.526	1.056	5.53	10.88

	(logged), Polity IV project index, bounded between -10						
Polity	and 10.	Polity IV Project	215	3.539	5.693	-10	10
Education	Education index	UNDP	215	0.715	0.165	0.4	0.98
HDI	Human Development Index	UNDP	215	0.698	0.099	0.4	0.95
CPI	average annual change in consumer price index in 2004-2005 (logged)	UNDP	208	6.025	3.743	0.7	13.4
Milex	Military expenditures, (logged)	SIPRI	214	9.322	2.115	4.17	12.52
Urban	% people living in urban areas	UNDP	215	50.288	18.691	16	95
Gini Index	Gini index of income inequality (logged)	UNDP	208	3.606	0,112	3.4	3.80

Since the HDI index depends upon also upon GDP per capita, they have not been included in the same regressions. According to the same criterion, military expenditures and GDP have not been included in the same regression.

TABLE 3 - DEPENDENT VARIABLE: LOG VICTIMS BY EVENT (NEGATIVE BINOMIAL REGRESSION)

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Pastvict	**0,06****	**0,049***	**0,047***	**0,048***	**0,054****	**0,054****	**0,051***	**0,054****	**0,055****	**0,05***
	(0,029)	(0,029)	(0,028)	(0,281)	(0,0286)	(0,0286)	(0,0284)	(0,0279)	(0,028)	(0,029)
	[0,03]	[0,08]	[0,09]	[0,09]	[0,06]	[0,06]	[0,07]	[0,05]	[0,05]	[0,10]
Gdppc		**-0,16*****	**-0,24*****	**-0,2*****						
		(0,05)	(0,081)	(0,0622)						
		[0,00]	[0,00]	[0,00]						
Polity			-0,008	-0,009		0,0004		-0,004		
			(0,009)	(0,009)		(0,0083)		(0,008)		
			[0,399]	[0,293]		[0,96]		[0,651]		
Urban			0,004							
			(0,005)							
			[0,46]							
Education			0,182	0,36						
			(0,450)	(0,392)						
			[0,68]	[0,359]						
HDI					**-1,21*****	**-1,22*****	**-1,08****			
					(0,499)	(0,5235)	(0,502)			
					[0,01]	[0,02]	[0,03]			
CPI										
Milex							-0,253	**-0,04***	**-0,04***	
							(0,0222)	(0,0215)	(0,0215)	

							[0,256]	[0,09]	[0,09]	
(milex*polity)										
Population										**0,09***** (0,035) [0,01]
Gini										
(Gini * Polity)										
(population*polity)										
Const	**0,73***** (0,090) [0,00]	**1,91***** (0,397) [0,00]	**2,26***** (0,485) [0,00]	**2,02***** (0,388) [0,000]	**1,58***** (0,366) [0,00]	**1,58***** (0,374) [0,00]	**1,73***** (0,39) [0,00]	**1,10***** (0,227) [0,00]	**1,08***** (0,225) [0,00]	-0,28 (0,400) [0,48]
Obs	**201**	**201**	**201**	**201**	**201**	**201**	**201**	**201**	**201**	**201**
Log Likelihood	**-374,009**	**-369,023**	**-367,055**	**-368,407**	**-371,092**	**-371,091**	**-370,522**	**-372,66**	**-372,755**	**-371,023**
LR - $\chi 2$	**4,51**	**16,25**	**19,2**	**18,96**	**12,46**	**12,5**	**13,32**	**8,01**	**7,73**	**13,46**

Notes: robust standard errors in parenthesis, p-values in square brackets, ***significant at 1%, ** significant al 5%, *significant at 10%. For sake of readability statistically significant coefficients are in bold.

TABLE 3 - (CONTINUED) - DEPENDENT VARIABLE: LOG VICTIMS BY EVENT (NEGATIVE BINOMIAL REGRESSION)

	11	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
Pastvict	**0,05***	**0,051***	**0,054****	**0,049***	**0,054****	**0,051****	**0,054****	**0,047***	**0,051***	0,045*
	(0,03)	(0,029)	(0,028)	(0,028)	(0,029)	(0,028)	(0,029)	(0,028)	(0,029)	(0,028)
	[0,10]	[0,08]	[0,05]	[0,08]	[0,06]	[0,07]	[0,06]	[0,09]	[0,08]	[0,11]
Gdppc				**-0,16*****				**-0,24*****		**-0,25*****
				(0,05)				(0,0799)		(0,085)
				[0,00]				[0,00]		[0,00]
Polity										
Urban							0,10	0,235	0,068	0,162
							(0,246)	(0,236)	(0,263)	(0,262)
							[0,70]	[0,32]	[0,80]	[0,53]
Education	1,16							0,028		0,287

	(0,862)							(0,454)		(0,631)
	[0,18]							[0,95]		[0,65]
HDI	**-2,9****				**-1,23*****	**-1,09****	-1,585		-1,316	
	(1,54)				(0,515)	(0,519)	(1,036)		(1,113)	
	[0,06]				[0,02]	[0,04]	[0,12]		[0,237]	
CPI									0,083	0,031
									(0,068)	(0,078)
									[0,22]	[0,692]
Milex						-0,025				
						(0,022)				
						[0,257]				
(milex*polity)							0,000	-0,000	-0,000	-0,001
							(0,0001)	(0,001)	(0,001)	(0,001)
							[0,83]	[0,72]	[0,92]	[0,43]
Population	0,04									
	(0,035)									
	[0,27]									
Gini		**-0,69***								
		(0,408)								
		[0,09]								
(Gini * Polity)			-0,001							
			(0,002)							
			[0,566]							
(population*polity)				-0,000	0,0001	0,0001				
				(0,0007)	(0,000)	(0,0006)				
				[0,655]	[0,85]	[0,873]				
Const	**1,49****	**3,25****	**0,77*****	**1,96*****	**1,59*****	**1,73*****	**1,46*****	**1,64*****	**1,28*****	**1,78*****
	(0,764)	(1,481)	(0,096)	(0,392)	(0,370)	(0,395)	(0,51)	(0,53)	(0,566)	(0,744)
	[0,05]	[0,03]	[0,00]	[0,00]	[0,00]	[0,00]	[0,00]	[0,00]	[0,02]	[0,02]
Obs	**201**	**196**	**196**	**201**	**201**	**201**	**201**	**201**	**197**	**197**
Log Likelihood	**-369,14**	**-363,958**	**-365, 104**	**-368,868**	**-371,076**	**-370,51**	**-371,02**	**-368,172**	**-364,327**	**-361,448**
LR - χ2	**16,92**	**7,32**	**3,93**	**17,16**	**12,42**	**13,27**	**12,68**	**18,89**	**15,56**	**20,42**

Notes: robust standard errors in parenthesis, p-values in square brackets, ***significant at 1%, ** significant al 5%, *significant at 10%. For sake of readability statistically significant coefficients are in bold.

First, the main hypothesis of this work is confirmed. The number of victims of terrorist incidents is positively associated with the number of victims of the previous incident in the same country. In particular, for a one-unit increase in the number of victim of the previous incident the number of victims of current incident increases by 5%. About statistical significance. In the simplest specification (column 1) the dependent variable *pastvict* is statistically significant at 3%. In specifications 5-9, 13, 15 and 17 the dependent variable *pastvict* is significant at 5% whereas in columns (2-4, 10-12, 14, 16, 18 and 19) *pastvict* is significant around at 10% (in particular ranging from 7% to 9%). However, in most cases, the degree of statistical significance ranges from 5% to 9%. For sake of clarity, the p-values have been included in table 3. Moreover, in all specifications coefficients do not differ remarkably. As a robustness check, some more parsimonious regressions have been ran deleting the intercept (see the appendix for the results). Results are significantly robust and confirm the main results of the analysis. Namely, the number of victims of attacks is associated with the number of victims of the previous attack in the same country. In particular, it seems that the number of victims is increasing in the number of victims of the previous incident. Coefficients are even slightly larger than those resulting from basic specifications.

Second, a negative significant association between socio-economic environment and terrorist activity also emerges. In models 2,3,4,14 and 18 the association between GDP per capita and the number of victims is significantly negative. The coefficients are smaller in specifications including a smaller number of covariates (2 and 14). In models which include the Human Development Index (HDI) index, the association between the HDI and the dependent variable is also significantly negative (columns 5,6,7, 11, 15,16) whereas it turns to be insignificant in specifications 17 and 19. In general, the econometric models perform better while using HDI instead of GDP per capita as proxy of socio-economic well-being. This indirectly confirms that GDP per capita as measure of well-being seems to be inadequate.

Perhaps, the most informative results come out from specifications 5 and 6 where the number of Past victims is significant around at 5% and HDI at 1% respectively. In fact, this result supports both the thesis of the tournament and the opportunity cost. The idea that a root of terrorist activity depends also upon grievance for poverty and socio-economic seems to be confirmed. Perhaps, in the light of current results, it ought to be maintained that:

PROPOSITION*: In the period 2004-2008, the radical Islamist terrorism was more likely to emerge in the presence of disadvantageous socio-economic conditions and seemed to take the shape of a national tournament between different would-be jihadist groups. Brutality of terrorist attacks seemed to be enhanced by such a competition.*

Analysing the other covariates leads also to interesting results. Surprisingly, there is no significant association between the brutality of terrorist attacks and the institutional regime. In all specifications the variable polity capturing the institutional regime is never statistically significant. This is not in line with prevailing literature which stressed the negative association between terrorism, civil liberties and democracy (see Li, 2005). Perhaps, it does look less surprising when considering that the dependent variable is not the incidence of terrorist activities but the number of victims. That is, perhaps it is the choice of becoming a terrorist which can be associated with the lack of civil liberties or democratic representation.

Inequality in income distribution also comes out to be insignificant. The CPI applied in specifications 19 and 20 does not show any significant association. Military expenditures in specifications 8 and 9 appear to be negatively associated with the number of victims even if the coefficient is only weakly statistically significant (10%). Could it suggest that governmental domestic deterrence could lower terrorist brutality? The answer cannot be conclusive. First, the coefficients are small, only weakly significant and turns to be insignificant in specifications 3 and 16. Moreover, by deleting the intercept, military expenditures turns to be insignificant in all regressions (please see the table in the appendix). Therefore, at this stage the results about military expenditures have to remain inconclusive. This is also reasonable when considering that only a fraction of military expenditures is directly devoted to eradicating terrorism.

In specifications 13-20 some interaction effects are analysed. In specification 12 an interaction term between the Gini and polity index is not statistically significant. In specifications 13-15, given that Gini coefficients are independent of the size of population, we applied an interaction term between the Gini index and the size of population (population × Gini) but it is not significant. In those specifications the number of past victims remains significant although only weakly in specifications 13. The size of population (in columns 10 and 11) is statistically significant when it is regressed as only one covariate. And the

dependent variable appears to increase in the size of population. However, such finding is not conclusive. In column 11, the size of population turns to be insignificant. In both cases, the number of past victims turn to be only weakly significant (around at 10%) even if the coefficient does not differ from other regressions. A third interaction term is between the size of population and the institutional regime (population × polity). It is statistically insignificant.

Summary and conclusion

The empirical results confirm the main hypothesis of this work, namely that **the number of victims of a terrorist attack is related to the number of victims of past attacks.** In particular, it seems that the number of victims is increasing in the number of victims of the previous terrorist incident. This seems to confirm that would-be terrorist groups behave as they were in a tournament. In short, they observe the results of past attacks and maximize their efforts in order to make attacks at least equally destructive as the foregoing attacks. This empirical result is new and sheds new light upon the 'production' of transnational terror.

Moreover, what we would also claim is that the empirical analysis is based upon a selection of attacks which fit the Al Qaeda style and approach. This makes the analysis peculiar. That is, it cannot be compared with foregoing studies which did not disentangle behaviour of would-be Al Qaeda cells from the complex and heterogeneous universe of terrorism.

The policy implications descending from the findings of this study are somehow puzzled. First, the traditional result. A general improvement of standard of living has the potential to reduce the likelihood (or even the brutality) of terrorist attacks. In fact, results show a negative association between number of victims and HDI and GDP per capita alternatively. Secondly, an additional prescription is related to funding. Needless to say, since reward to would-be terrorist groups is expected to be monetary, therefore, tracking financial flows of terrorist organization becomes a critical task. The argument for an international cooperation on regulating financial flows is thus strengthened.

APPENDIX

Dependent Variable: Log Victims by Event (Negative Binomial Regression)

	1	2	3	4	5	6	7	8	9	10
Pastvict	**0.26**	**0.07**	**0.089**	**0.07**	**0.07**	**0.06**	**0.06**	**0.055**	**0.071**	**0.056**
	(0.017)	(0.027)	(0.028)	(0.027)	(0.027)	(0.027)	(0.028)	(0.028)	(0.027)	(0.029)
	[0.00]	[0.02]	[0.00]	[0.01]	[0.00]	[0.02]	[0.02]	[0.05]	[0.01]	[0.06]
gdppc		**-0.235**				**-0.243**		**-0.195**		**-0.37**
		(0.081)				(0.082)		(0.086)		(0.148)
		[0.00]				[0.00]		[0.02]		[0.01]
polity		0.006	-0.003	0.012					0.004	-0.000
		(0.010)	(0.009)	(0.011)					(0.0129)	(0.015)
		[0.54]	[0.77]	[0.27]					[0.78]	[0.48]
urban		**0.768**		**0.755**	**0.64**	**0.796**	**0.508**	**0.672**	0.446	**0.567**
		(0.181)		(0.233)	(0.210)	(0.189)	(0.221)	(0.191)	(0.295)	(0.196)
		[0.00]		[0.00]	[0.00]	[0.00]	[0.02]	[0.00]	[0.13]	[0.02]
Education		-0.74				**-0.81**		**-0.885**		0.13
		(0.464)				(0.464)		(0.509)		(0.802)
		[0.11]				[0.08]		[0.08]		[0.87]
HDI			**0.742**	**-2.88**	**-2.61**		**-2.115**		-1.93	
			(0.313)	(1.20)	(1.18)		(1.225)		(1.358)	
			[0.02]	[0.02]	[0.03]		[0.08]		[0.15]	
CPI							**0.127**	**0.128**	0.013	**0.23**
							(0.063)	(0.064)	(0.016)	(0.101)
							[0.04]	[0.05]	[0.41]	[0.02]
milex			0.013	-0.027					0.01	0.094
			(0.021)	(0.024)					(0.031)	(0.059)
			[0.54]	[0.24]					[0.76]	[0.11]
(milex*polity)					0.001	0.001	0.001	0.001		
					(0.001)	(0.001)	(0.001)	(0.001)		
					[0.318]	[0.354]	[0.654]	[0.542]		
Obs		**201**	**201**	**201**	**201**	**201**	**197**	**197**	**197**	**197**
Log Likelihood		**-372.658**	**-379.883**	**-379.883**	**-375.201**	**-372.363**	**-367.165**	**-364.348**	**-368.916**	**-362.716**
LR - $\chi 2$		**384.82**	**331.37**	**331.37**	**366.65**	**384.06**	**377.91**	**392.2**	**374.4**	**410.67**

Notes: constant term suppressed; robust standard errors in parenthesis. p-values in square brackets. * significant at 1%. ** significant al 5%. ***significant at 10%. For sake of readability statistically significant coefficients are in bold.

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