

# AL QAEDA AS A TOURNAMENT: EMPIRICAL EVIDENCE

**Raul Caruso**  
**Istituto di Politica Economica**  
**Università Cattolica del Sacro Cuore di Milano**  
[raul.caruso@unicatt.it](mailto:raul.caruso@unicatt.it)

**Abstract:** *This short paper aims to find an empirical evidence that al Qaeda behaves as a contest organizer rewarding a prize – namely, official membership and economic rewards – to candidate extremists 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) tries to make attacks at least equally destructive as the foregoing attacks. The testable implication is that: the number of victims must depend upon the number of victims of past attacks. Resulting evidence confirms the hypothesis. At the same time, results show that al Qaeda-style 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.

## 1. Introduction

Recent studies on terrorism emphasize the socio-economic determinant 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 ought to be likely to 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. Krueger and Maleckova (2003) challenged the first idea 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. Li (2005) stresses the negative association between terrorism and democracy. Abadie (2006) 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. Berrebi (2007) with a specific focus on suicide attacks in Israel shows that that both higher education and standard of living are positively associated with the incidence of suicide attacks. Freytag et al. (2008), present mixed results either confirming or contrasting the idea that terrorism is negatively associated with better socio-economic conditions.

In Caruso and Locatelli (2008) a novel interpretation of al Qaeda-style terrorist behaviour has been proposed. 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<sup>1</sup>. 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 groups loosely related to the 'core' of the terrorist network. The prize could be assumed to be some sort of ideological blessing (being accepted as a full and honourable member of the organization) as well as economic reward<sup>2</sup>. Hence, these candidate cells compete with each other. Agents – namely the would-be terrorist groups – play à la Nash and maximize their efforts. In particular, all candidate groups may believe to be involved in a contest made by multiple rounds.

A crucial point is represented by information. First, participants do not know the number of contestants. As noted in Munster (2006) this increases the total level of efforts exerted. Secondly, all the participants are privately informed about their abilities – in other words, each group 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 demonstrated 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. In fact, a tournament is nothing but a multi-stage contest. 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<sup>3</sup>. In the presence of costless information acquisition, it is 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.

---

<sup>1</sup> Traditional contest models are formally grounded on Tullock (1980), and found seminal explanations in O'Keefe, Viscusi, Zeckhauser (1984); Rosen (1986); Dixit (1987). Recent excellent contributions are Moldovanu and Sela (2001) and Moldovanu et al. (2007).

<sup>2</sup> It is established that al Qaeda has given grants to local groups that devised promising plans for attacks.

<sup>3</sup> In a recent article Rohner and Frey (2007) demonstrated empirically that media attention and terrorism do mutually Granger cause each other.

## 2. Testable Implications and empirical strategy.

As noted earlier, in the presence of a tournament, each group observes the results of some previous attacks. Hence to maximize their own probability of winning the prize, each group (maximizes its effort) tries to make attacks at least equally destructive as the foregoing attacks. The testable implication is that: *the number of victims depends upon 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. That is, the implicit limiting assumption is that if a tournament takes shape, it does at a national level.

Because the dependent variable is event count, ordinary least squares (OLS) estimates can be inefficient, 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<sup>4</sup>. 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. 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);
- (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 201. Eventually, the sample estimation covers 22 countries<sup>5</sup> over the period January 2004 – March 2008. For each record the total numbers of victims has been computed as the sum of deaths and injured. 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. Data for Somalia are missing. Hence it has not been included. The institutional regime has been captured through the polity index as developed in Polity IV project, Political Regime Characteristics and Transitions, 1800-2006. This index is bounded between -10 and 10 where 10 means perfect democracy.

---

<sup>4</sup> The dataset is downloadable at the address <http://wits.nctc.gov/Export.do> (last access september 2008).

<sup>5</sup> Algeria, Bangladesh, Egypt, Eritrea, Ethiopia, France, India, Indonesia, Iran, Jordan, Pakistan, Philippines, Qatar, Russian Federation, Saudi Arabia, Spain, Syria, Thailand, Turkey, UK, Uzbekistan, Yemen.

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 is 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 years 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. Data on military expenditures (denoted by Milex) have been extracted from the SIPRI dataset and are expressed in constant (2005) millions of US\$. Table 1 summarises sources of data and descriptive statistics whereas empirical results are presented in table 2.

TABLE 1- VARIABLES, DESCRIPTIVE STATISTICS AND SOURCES

Description		Source	Obs	Mean	Std. Dev.	Min	Max
<b>Victims</b>	Victims of incidents (logged)	NCTC	215	2.445	1.681	0	7.617
<b>PastVict</b>	Victims of previous incident in the same country (logged)	NCTC	201	2.502	1.647	0	7.142
<b>Gdppc</b>	GDP per capita (logged), Polity IV project index, bounded between -10 and 10.	IMF, WEO	215	7.526	1.056	9	10.88
<b>Polity</b>		Polity IV Project	215	3.539	5.693	-10	10
<b>Educatio n</b>	Education index	UNDP	215	0.715	0.165	0.4	0.98
<b>HDI</b>	Human Development Index	UNDP	215	0.698	0.099	0.41	0.95
<b>Milex</b>	Military expenditures, (logged)	SIPRI	214	9.322	2.115	4	9
<b>Urban</b>	% people living in urban areas	UNDP	215	50.28	18.691	16	95

TABLE 2. ECONOMETRIC RESULTS  
DEPENDENT VARIABLE: LOG VICTIMS BY EVENT  
(NEGATIVE BINOMIAL REGRESSION)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Pastvict</b>	<b>0.049***</b> (0.029) [0.08]	<b>0.047***</b> (0.028) [0.09]	<b>0.0475***</b> (0.028) [0.09]	<b>0.0536**</b> (0.0286) [0.06]	<b>0.0537**</b> (0.0286) [0.06]	<b>0.051***</b> (0.0284) [0.07]	<b>0.054**</b> (0.0279) [0.05]	<b>0.055**</b> (0.028) [0.05]
<b>Gdppc</b>	<b>-0.156*</b> (0.05) [0.00]	<b>-0.24*</b> (0.081) [0.00]	<b>-0.2*</b> (0.0622) [0.00]					
<b>Polity</b>		-0.008	-0.009		0.0004		-0.004	

		(0.009)	(0.009)		(0.0083)		(0.008)	
		[0.399]	[0.293]		[0.96]		[0.651]	
<b>Urban</b>		0.004						
		(0.005)						
		[0.46]						
<b>Education</b>		0.182	0.36					
		(0.450)	(0.392)					
		[0.68]	[0.359]					
<b>HDI</b>				<b>-1.214*</b>	<b>-1.219*</b>	<b>-1.078**</b>		
				(0.499)	(0.5235)	(0.502)		
				[0.01]	[0.02]	[0.03]		
<b>Milex</b>						-0.253	<b>-0.04***</b>	<b>-0.04***</b>
						(0.0222)	(0.0215)	(0.0215)
						[0.256]	[0.09]	[0.09]
<b>Const</b>	<b>1.914</b>	<b>2.26*</b>	<b>2.023</b>	<b>1.58*</b>	<b>1.58*</b>	<b>1.73*</b>	<b>1.097*</b>	<b>1.082*</b>
	(0.397)	(0.485)	(0.388)	(0.366)	(0.374)	(0.39)	(0.227)	(0.225)
	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]	[0.00]
<b>Obs</b>	<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>	<b>201</b>
<b>Log Likelihood</b>	<b>-369.023</b>	<b>-367.0547</b>	<b>-368.407</b>	<b>-371.092</b>	<b>-371.091</b>	<b>-370.522</b>	<b>-372.66</b>	<b>-372.755</b>
<b>LR – <math>\chi^2</math></b>	<b>16.25</b>	<b>19.2</b>	<b>18.96</b>	<b>12.46</b>	<b>12.5</b>	<b>13.32</b>	<b>8.01</b>	<b>7.73</b>

Notes: robust standard errors in parenthesis. p-values in square brackets. \* significant at 1%. \*\* significant at 5%. \*\*\*significant at 10%. Statistically significant coefficients are in bold.

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. 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. Qualitative results remain unchanged.

First, the main hypothesis of this work is confirmed. The number of victims of terrorist incidents is associated with the number of victims of the previous incident in the same country. In specifications 4-8 the crucial variable Pastvict is significant at 5% whereas in columns (1-3) specifications is significant at 10%. The results confirm that 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. Interpreting the coefficients, it ought to be maintained that an increase of 1 victim in the previous attack leads an increase of 5% in the number of victims in the following attack.

Second, a negative significant association between socio-economic environment and terrorist activity also emerges. In models (1-3) the association between GDP per capita and the number of victims is significantly negative. In models (4-6) the association between the Human development index and the dependent variable is also significantly negative. The idea that a root of terrorist activity depends also upon grievance for poverty and socio-economic seems to be confirmed. However, there is no significant association with institutional regime. In all specifications (1-8) 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).

## Summary and conclusion

The empirical results confirm the main hypothesis of this work, namely that the victims of a terrorist attack depend upon the number of victims of past attacks. This seems to confirm that would-be terrorist groups behave as they were in a tournament. They observe the results of past attacks and maximize their efforts in order to make attacks at least equally destructive as the foregoing attacks. What I 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 world of terrorism.

## REFERENCES

- ABADIE A., (2006), Poverty, Political Freedom and the Roots of Terrorism, *The American Economic Review, Papers and Proceedings*, vol.96, n.2, pp. 50-56.
- AMEGASHIE J.A., (2006), Information Transmission in Elimination Contests, University of Guelph, working paper.
- AMEGASHIE J.A., CADSBY C.B., SONG Y., (2006), Competitive Burnout: Theory and experimental evidence, *Games and Economic Behavior*, vol. 59, pp.213-239.
- BERREBI, C., (2007), Evidence about the Link Between Education, Poverty and Terrorism among Palestinians, *Peace Economics, Peace Science and Public Policy*, vol. 13, n.1, , article 2, <http://www.bepress.com/peps/vol13/iss1/2>.
- CARUSO R., LOCATELLI A., (2008), Deadly Contests: An Economic Note on al Qaeda's Reward System, *The Economics of Peace and Security Journal*, vol. 3, n. 2, pp. 62-67.
- DIXIT A., (1987), Strategic Behavior in Contests, *The American Economic Review*, vol. 77, n. 5, pp. 891-898.
- FREYTAG A., KRUGER J.J., SCHNEIDER F., (2008), The Origins of Terrorism, Cross Country Estimates on socio economic determinants of terrorism, paper presented at the second NEAT workshop, Bruxelles, September 2008.
- KRUEGER A., MALECKOVA J., (2003) Education, Poverty, and Terrorism: Is There a Causal Connection?, *Journal of Economic Perspectives*, vol. 17, n. 4, pp. 119-144
- LI Q., (2005), Does Democracy Promote or reduce Transnational Terrorist incidents?, *Journal of Conflict Resolution*, vol. 49, n.2, pp.278-297.
- MOLDOVANU B., SELA A., (2001) The Optimal Allocation of Prizes in Contests, *The American Economic Review*, vol. 91, n. 3, pp. 542-558.
- MOLDOVANU B., SELA A., SHI X., (2007), Contests for Status, *Journal of Political Economy*, vol. 115, n.2, pp. 338-363.
- MORGAN J., VARDY F., The Value of Commitment in contests and tournaments when observation is costly, *Games and Economic Behavior*, vol. 60, n.2, pp. 326-338
- MUNSTER J., Contests with an unknown number of contestants, *Public Choice*, vol. 129, pp. 353-368.
- NTI K., (2004), Maximum Efforts in Contests with Asymmetric Valuations, *European Journal of Political Economy*, vol. 20, pp. 1059-1066.
- NTI K., (1999), Rent-Seeking with Asymmetric Valuations, *Public Choice*, vol. 98, 1999, pp. 415-430.

- O'KEEFFE M., VISCUSI K., ZECKHAUSER R., (1984), Economic Contests: Comparative Reward Schemes, *Journal of Labor Economics*, vol. 2, n. 1, pp. 27-56.
- ROHNER D., FREY B.S., (2007), Blood and Ink! The Common-interest-game between terrorist and the media, *Public Choice*, vol. 133, pp. 129-145.
- ROSEN S., (1986), Prizes and Incentives in Elimination Tournaments, *The American Economic Review*, vol. 76, n. 4, pp. 701-715.
- TULLOCK G., *Efficient Rent Seeking*, in J. Buchanan, R. Tollison, G. Tullock, (eds.), *Toward a Theory of the Rent-seeking Society*, College Station, TX, Texas A&M University Press, 1980, pp. 97-112