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Caruso, Raul and Locatelli, Andrea

Universita Cattolica del Sacro Cuore, Milano

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# **Deadly Contests**

## **An economic note on al Qaeda's reward system**

*Raul Caruso\* – Andrea Locatelli†*

After 9/11, a copious literature emerged on the problem of contemporary international terrorism. In particular, the tight intermingling of religious fanaticism and mass violence, as epitomized by al Qaeda, led many to speculate on the essence of this phenomenon. As a result, terms like terrorism and asymmetric warfare are now widely recognized as “high concepts”.

Needless to say, terrorism is also a key issue from a policy-oriented perspective. As the frequency and lethality of terror attacks clearly shows, the threat posed by organizations like al Qaeda is far from transitory. Quite the contrary, as some noted<sup>1</sup>, this kind of “asymmetric warfare” seems to be a defining feature of the current security context. As a result, any state's security agenda should be broadened to include counter-terrorism among its top priorities. For sure, the damage suffered after 9/11 made the U.S. the most active supporter of a full-fledged war on terror. What is worth noting, though, is that other states, albeit victims of terror attacks, developed different strategies to fight terrorism – as it is the case with European states, which explicitly declined the military option in their own fight against terrorism<sup>2</sup>.

The aim of this article is to interpret al Qaeda's *modus operandi* in the light of the economic theory of contests<sup>3</sup>. The main idea expressed here is that al Qaeda can be considered as a firm (whose CEO is Osama bin Laden)<sup>4</sup> rewarding an indivisible prize – namely, official membership – and affiliated groups

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\* **Raul Caruso** is research fellow at the Institute of Economic Policy, Università Cattolica del Sacro Cuore, Milan, Italy. Contact: raul.caruso@unicatt.it.

† **Andrea Locatelli** is post-doc fellow at the Dipartimento Politica, Istituzioni e Storia, University of Bologna, Italy. Contact: andrea1.locatelli@unicatt.it.

<sup>1</sup> From two very different perspectives, see Hammes (2004); Colombo (2006).

<sup>2</sup> See on this point the 2003 European Security Strategy, *A Secure Europe in a Better World*, Brussels, 12 December 2003.

<sup>3</sup> We first explored this argument in Caruso, Locatelli (2003).

<sup>4</sup> Hoffman (2003, pp. 26-27).

compete with each other to win the prize. As we will see, this logic has various pros and some cons. In order to devise an effective counterstrategy, Western countries should target the key elements of such a contest: al Qaeda's communication strategy and the prize setting.

This brief article is divided into three sections. The next paragraph will describe al Qaeda's main features. The underlying idea is that with respect to previous terrorist groups al Qaeda is characterized by original attributes that makes it a much more dangerous and elusive threat. Section two presents some insights drawn from economic theory of contests, in order to account for al Qaeda's relationship with its cells. Eventually, section three will briefly discuss some tentative strategies to counter-terrorism.

### **Why is al Qaeda different from previous terrorist organizations?**

If compared to traditional terrorist groups, al Qaeda displays several elements of novelty. Among its defining features, Audrey Kurt Cronin suggests four main characteristics: (a) fluid organization, (b) methods of recruitment, (c) financing instruments and (d) the use of communication media<sup>5</sup>. While all of them are relevant when it comes to framing a sound counterstrategy, for the purposes of our analysis it is critical to focus our attention exclusively on the way al Qaeda cells are related and interact with each other – i.e. the organizational dimension broadly conceived.

It is this realm that makes terrorists so difficult to hunt down. Indeed, thanks to the flexibility embedded in its own structure, al Qaeda is continuously evolving, up to the point that “the al Qaeda of September 2001 no longer exists”<sup>6</sup>. In fact, mainly as a consequence of the US-led war on terror, bin Laden's creation proved to be a flexible, agile and resilient structure, able to swiftly and effectively adapt and adjust to external pressures. In fact, rather than an organization, al Qaeda is closer to the original meaning of the term – i.e. a concept, an idea, a mission<sup>7</sup>. In order to describe its specificity, analysts have

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<sup>5</sup> Cronin (2006, pp. 32-39).

<sup>6</sup> Hoffman (2003, p. 32).

<sup>7</sup> As noted by many commentators, the original meaning of al Qaeda is essentially “the base”, “the foundation”, or even “the method” – which stands to point out the organization's catalyst role among different groups.

coined a plethora of terms: network, group, movement, clique. In other words, anything denoting a flexible structure with fuzzy boundaries<sup>8</sup>. Such an evolution is probably the best indicator of al Qaeda's resilience and extent. As a matter of fact, no other terrorist group ever succeeded in developing and managing such a complex and smooth organization on a global scale. Especially after the evolution initiated in 2001, after the American campaign in Afghanistan destroyed the training camps, al Qaeda has basically become the hinge of a hybrid terrorist organization, loosely connected to other like-minded groups and freelancers<sup>9</sup>.

For the whole organization this may potentially constitute a weak point, as the command and control mechanisms may be hindered by the lack of a clear hierarchical line. Yet, the advantage is clear, and can be measured in terms of flexibility and autonomy as well as in terms of resilience to penetration and compromise<sup>10</sup>. The main problem with this kind of structure, therefore, is for counter-terrorism. On one hand, hunting down al Qaeda's leaders is almost impossible; on the other hand, loose and ideological ties allow al Qaeda to extend its own membership almost infinitely. It is an evidence of this the ongoing (and quite fruitless) debate on the nature, size and width of the network. The real problem is that no one really knows how many members are currently or have been previously part of al Qaeda<sup>11</sup>.

Still, if the organizational setting is so flexible, and ideology (by definition) provides just a broad framework of action, what makes al Qaeda hang together? Admittedly, given its secret nature, what we can do is just to suggest some tentative answers. Yet, recent research provides interesting insights – on which most analysts agree – related to recruitment. If there is a loose hierarchical tie among cells, a critical question is to discover the defining principle used to determine roles and functions within the organization. Put it differently, if the bottom-up process is as important as top-down control, what can we say about

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<sup>8</sup> Coll, Glasser (2005).

<sup>9</sup> Sageman (2004).

<sup>10</sup> Jackson (2006, pp. 247-48). For an in-depth discussion of networks see Arquilla, Ronfeldt (2001).

<sup>11</sup> According to a study led by the well known Institute for Strategic Studies, at least 18.000 individuals trained in al Qaeda's Afghanistan camps are now supposedly spread over 60 countries all over the world. International Institute for Strategic Studies (2004, p. 6). For a discussion on whether this figure is accurate, see Hoffman (2004, p. 559).

the recruitment method? How can independent groups become affiliated to al Qaeda? How close can they get to the leadership? As discussed in Sageman's volume, individuals (or, more frequently, groups)<sup>12</sup> get involved in the organization not because pressed by actual al Qaeda members, but mainly as a result of a selection process among volunteers competing for a chance to enjoy the al Qaeda brand. So, rather than a recruiting process, it seems more appropriate to talk about a voluntary application to join the organization<sup>13</sup>.

Albeit a conjecture, assume that the number of potential applicants is much higher than the promised membership. This situation is especially beneficial for al Qaeda for at least three reasons. Firstly, there is no need for bin Laden and his fellows to invest resources in any recruitment drive. Secondly, and most importantly, such an abundance of applications allows al Qaeda to be very selective in granting membership. Finally, apart from saving time and money, these loose ties help conceal the organization's structure. The only weakness of the self-starters system is that, by virtue of the spontaneous origins of would-be terrorists, the command and control capabilities are quite limited. As a side effect, therefore, al Qaeda could be evoked and get stuck in actions far from the leaders' main interests. Secondly, and partially related to this last point, the potential of ideology as a common denominator should not be exaggerated, as the ideological appeal is a necessary, but hardly sufficient condition.

Summing up, the point is that al Qaeda poses a more insidious threat than previous terrorist organizations. This is due to its final goal, as well as the organizational features of the network. But still, some insight on the internal functioning of the organization may provide new grounds for counterterrorist policies. In order to proceed in this direction, we now turn to the contribution of economic theory of contest.

It is worth noting that in recent times a different interpretation has been proposed. Many observers raised the argument that terrorist cells behave according to an open-source mechanism<sup>14</sup>. This interpretation mainly focuses

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<sup>12</sup> Sageman (2004 , p. 110).

<sup>13</sup> Cozzens (2005).

<sup>14</sup> We are grateful to Jurgen Brauer for bringing the issue to our attention.

on the structure of the network. Terrorists would be akin to developers of a free Linux-style software. There are some factors which could make this interpretation fitting: (a) the lack of a rigid hierarchical structure; (b) the decentralized organization of the network; (c) the self-initiative of developers; (d) the spontaneous elitist evolution of contributors. However, there are some other factors which make such interpretation incorrect.

Needless to say, in an open-source mechanism, co-developers produce a public good<sup>15</sup>. They can consume this public good and such consumption enters positively the utility function of both developers and users. By contrast, terrorist cells produce a public bad. They cannot consume the good itself and it cannot enter positively any utility function. Looking at the organization of the structure, there are also some characters which limit this kind of interpretation. In the open-source mechanism the developer faces an opportunity cost of her or his time. While developing an open-source project, he or she must give up the development of other projects. This is possible because programming skills are pervasive and simply signalled. Therefore, developers clearly face a cost. This seems not to be the case with terrorists. Since terrorism is a secret activity by definition, terrorists would not be engaged in other activities. Terrorist skills are not pervasive and, in most cases, they cannot be disclosed. Last but not least, in an open-source structure, developers can communicate and interact with each other. This does not seem to be the case of terrorist network. As many observers believe, communication and interaction among terrorist cells seem very low.

The insight that could be drawn from open-source interpretation relates to the motivations of developers. Open-source is characterized by two distinct incentives leading to delayed payoffs: (i) a *career concern incentive*, namely the 'bid' on future well-paid job offers. (ii) the *peer-recognition* (something akin to academic research). They both fall under the heading of *signalling incentive*, which – according to Lerner and Tirole– strongly relies on: (a) the highest possible visibility of performance to the relevant audience, (b) the highest possible impact of effort on performance, and (c) the highest perceived causality between performance and talent.

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<sup>15</sup> See Lerner, Tirole (2002).

However, the latter considerations do also fit with the economic theory of contest which is expounded in the next paragraph.

### **Some Insights from Contest Theory**

There is a growing awareness among economists and other social scientists that many phenomena can be modelled as contests. A contest is commonly defined as a game in which players compete over 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. This does constitute the main difference with auctions, in which agents do not bear entirely the cost of the bids. This is also the rationale to label contests as all-pay auctions<sup>16</sup>.

Literature on contests commonly implies the concept of Nash equilibrium. A strategy is assumed to be a Nash equilibrium when no player involved has any incentive to deviate from it. The emergence of a Nash non-cooperative equilibrium commonly happens when agents have no opportunity of coordination. This is the classical case of prisoner's dilemma, i.e. where actors choose their favourite strategy even if it leads to a sub-optimal result, because they are not able to coordinate. The lack of coordination leads to a non-cooperative equilibrium. In other words, as rational agents, they maximize their expected payoff. Albeit it appears trivial, the concept of maximizing agents becomes fundamental while analysing agents' behaviour in contests. Consider two simple examples. In a race, athletes cannot coordinate their actions. In the presence of an indivisible prize (call this winner-take-all contest) they will put their maximum effort to win the prize. In such a case, coordination is clearly not feasible. Only one player can become the winner. There is no alternative strategy. Agents play *à la* Nash and maximize their efforts in order to maximize their payoffs. In a similar fashion, scholars competing for research grants cannot coordinate each other. When grants are assigned on personal basis and

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<sup>16</sup> Traditional contest models are formally grounded on Tullock (1980), and found seminal explanations in O'Keeffe, Viscusi, Zeckhauser (1984, pp. 27-56); Rosen (1986); Dixit (1987). The first and seminal application has been developed by Tullock (1980) for rent-seeking phenomena.

there is no opportunity to agree on a pre-determined sharing of the ‘cake’, the only feasible strategy is writing the best possible proposal.

Hereafter we mention some common findings of contest literature that might be useful for our analysis. In particular, in our framework we are interested in accounting for agents’ behavior and efforts.

To begin with, the level of effort applied by every agent is strictly correlated to the value of the ‘prize’ – i.e. the higher the evaluation of the ‘prize’, the higher will be the commitment to put the maximum effort into the contest. 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 to win the contest is higher when it exerts higher efforts than agent B. Then, the only feasible strategy for both A and B will be exerting the maximum possible effort. In such a way, each player can attain its maximum payoff. To recapitulate this point, contest theory predicts that the maximizing behaviour is the strategy applied by each agent. This can also be generalized in the presence of a higher number of contestants. In a multi-agents scenario, however, the theory also predicts that total efforts decrease in the number of contestants. That is, when agents are aware that the contest is joined by more agents, their individual effort will decrease, as well as the sum of all individual efforts.

Of course, these general predictions about agents’ behaviour can be considered as *ceteris paribus* conditions. In general, these properties hold even if other factors affect 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 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 in 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 own



maximum efforts into the race, and given that their level of efforts depends upon the value of the prize, they would exert the same amount of efforts. In such a case, the outcome of the contest will be determined – everything else 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 undertaken 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 in different stages of the game, their effort will be fruitless.

As exogenous conditions, consider the design of the contest. That is, the agent that is providing the ‘prize’ of the contest can somehow modify the architecture of the contest in order to bear an influence on the total effort exerted. The simplest case is that of providing different prizes. This is the common case of sport contests where prizes are offered for the winner but also for the runner up. Moldovanu and Sela<sup>17</sup> 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. Put differently, when the efforts are increasingly costly – that is when the cost increases as the contest goes on – different prizes do constitute an optimal choice for the design. In fact, when rational agents know that several prizes are provided – given the information available about other contestants’ abilities – they will put their maximum effort into the contest. In fact, even if they are aware that they cannot win the contest, they also would expend the maximum effort to get the other prizes. This is the case of sports as cycling, where different prizes are provided by organizer and then the total efforts of participants is maximized. By contrast, when the cost function is not convex – that it is not increasing in the effort – only one prize leads to the best design. In such a case, designer’ objective is also kept. The level of total effort is maximized. Setting 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.

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<sup>17</sup> Moldovanu, Sela (2001).

The few lines above were based on the implicit assumption that agents involved in a contest are symmetric apart from their own abilities. A difference in abilities clearly recalls an idea of ‘asymmetry’ that is common among students of political science. Asymmetry however can have different shapes. In the realm of strategic interactions, what is also affecting agents’ behaviour is an asymmetry of available information.

The simplest case refers to an asymmetry in the evaluation of the prize. That is, without any public disclosure, agents can evaluate differently the ‘prize’ of a contest. Since the level of efforts is positively correlated to the value of the prize, different evaluations of the stake lead to different levels of efforts between agents<sup>18</sup>. Nti analyses the case of a contest where participants evaluate differently the ‘prize’<sup>19</sup>. The common result of this contribution is that agents retaining a higher evaluation of the stake exert more efforts in the contest than low-evaluation participants. In particular, Hillman and Riley 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 more efforts, and as a consequence will be the favorite. Agent B, the ‘Underdog’, will exert fewer efforts. Then, increasing the favourite’s valuation increases its effort, but decreases the effort of the underdog. This result holds even if the underdog is superior in abilities. In fact, it would be possible to demonstrate that even if agent A is less skilled in abilities, it will be always the favorite regardless of its inferiority. In other words, this states that an asymmetry in the evaluation of the prize can be a driving force. To sum up, some inferences drawn from contest theory may apply to our framework:

1. All players maximize their own effort;
2. in the presence of an asymmetry in the evaluation of the prize, low evaluation players would give up;
3. low ability players would also give up;

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<sup>18</sup> Hillman, Riley (1989).

<sup>19</sup> Nti (1999); Nti, (2004).

4. the probability of collusion among players is very low;<sup>20</sup>

How does al Qaeda fit with the theory expounded above? In this view, al Qaeda may be portrayed as a contest organizer providing an indivisible prize to the best terrorist group. From time to time, bin Laden and his fellow start a competition among groups loosely related to the network. The prize – even if we do not have clear evidence – is represented by some sort of ideological blessing (being accepted as a full and honourable member of the organization) and economic reward<sup>21</sup>. More important than that, for our purposes, are the insights that we can get from contest theory on the way these cells compete with each other.

The key feature shaping this process is given by information. In a sense, the term relates to the fact that all the participants are privately informed about their abilities – in other words, each groups knows how much it can achieve, but ignores 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 a second sense, information can be seen as the process used by groups to signal their commitment and ability (and, by reverse, as the way bin Laden monitors their actions). 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 dozen of casualties somewhere in the world, such event is extensively broadcasted by international mass media. As a result, the link between effort and rewards is quite direct: the greatest effort is supposed to guarantee the prize. Or, put it differently, each group knows that in order to win the prize it will have to maximize the number of casualties. Moreover, since the groups can evaluate differently the prize to be rewarded, a spontaneous partitioning between high-ability and low-ability groups is predictable.

The implication of such a logic is twofold. On one hand, contrary to common wisdom, mass killing and the resulting psychological effect is not an end in itself, but rather a means for aspiring groups to win al Qaeda's prize. In

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<sup>20</sup> However, the possibility of collusion between heterogeneous agents in a contest has been analyzed in Caruso (2007).

<sup>21</sup> It is established that al Qaeda has given grants to local groups that devised promising plans for attacks. See on the point Bruce Hoffman (2003).

this view, target selection – as in case of train stations, malls, hotels – is not just the consequence of ideological considerations, but it is rather a matter of tactical calculations: these sites host hundreds of appealing targets, easy to strike and highly visible in terms of media coverage. A second implication is that, according to the model, a terrorist action *per se* is not enough to automatically grant membership. As a sort of *ex post* franchising<sup>22</sup>, al Qaeda reaps the benefits of the most successful attacks in terms of a huge return of image, while paying in turn – all things considered – a very limited cost.

### **Some Tentative Policy Prescriptions**

Six years after 9/11 the war on terror is well under way. As many analysts suggested in the wake of the attacks in New York and Washington, the fight against international terrorism is going to be a central element of any state's security policy for many years to come. Yet, as widely recognized, this kind of war must be fought on many fronts. A comprehensive grand strategy should encompass as many dimensions as possible, from homeland security to foreign aid<sup>23</sup> Discussing all of them would be of little utility here. Instead, what we hold more relevant is to consider how the model presented above may give some of these recommendations a theoretical framework.

Given the role played by information and communication in connecting the various nodes in which al Qaeda's structure articulates, it is first on these that counter-terrorism should focus. The meaning of communication is usually conceived broadly, and it just refers to the mere use of mass media or the Internet by bin Laden and his fellow. For sure, mastering advanced technologies proved critical in al Qaeda's capability to talk to multiple audiences – like potential new members, hostile governments and public opinions worldwide. However, this perspective blurs the line between internal and external communication. Following the model provided by contest theory, instead, what is important is the internal front of communication – i.e. the way information circulates among various bodies of the organization. As mentioned, for bin

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<sup>22</sup> See Farah, Finn (2003); Benjamin( 2003).

<sup>23</sup> Audrey Kurth Cronin and James Ludes come to include nine: diplomacy, intelligence, law enforcement, military force, the laws of war, psychological-political instruments, foreign aid and homeland security. Kurth Cronin, Ludes (2004).

Laden most of the advantages of starting contests derive from asymmetrical information. Collusion among competing groups is hindered by lack of knowledge of each others' means and intentions; likewise, scarce information on the criteria used to allocate the prize forces competing groups to maximize their effort.

Any counterstrategy, therefore, should be aimed at preventing these conditions from occurring. In this respect, two broad actions can be undertaken. The first one is to discredit bin Laden's promise. Or, in more sophisticated terms, to falsify and confuse the kind of information that candidate terrorists receive. It is up to the intelligence community to perform this task. In fact, secret services may adopt different instruments to interfere with al Qaeda's communication. This is a very sensitive issue, since evidently the risk involved in some intelligence practices for democratic countries is to disregard individual freedoms in favour of public security<sup>24</sup>. However, some action along this line is probably necessary to hunt down critical links of the organization. Even though these measures brake down only limited portions of the network<sup>25</sup>, they may work out in preventing attacks that require wide, coordinated action. As a result, terrorist violence would certainly not be eradicated, but it would be much harder for bin Laden to ignite and sustain the competition process among groups.

A second line of action concerns al Qaeda's means of support. As long as bin Laden's reward to self-starters is money, it is critical to limit al Qaeda's capacity of redistribute it. In economic terms, financial assets have been provided in a variety of ways, ranging from charitable organizations to self-financing through robberies. Indeed, most part of the transactions seems to involve limited amounts of money, mostly conceded to local groups by the central command. This figure is apparently confirmed by the fact that even the most famous and catastrophic attacks proved relatively cheap: just to make a few examples, the cost of the 2002 Bali bombing was about \$35.000, the attack to the USS *Cole* about \$50.000, while 9/11 cost less than half a million dollars<sup>26</sup>.

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<sup>24</sup> Wilkinson (2000).

<sup>25</sup> An interesting, though overconfident contribution in this sense is Farley (2003).

<sup>26</sup> International Institute for Strategic Studies (2004, p. 8).

Another channel for financing consists in the various autonomous al Qaeda-own or controlled companies. *“At one point, bin Laden was reputed to own or control approximately eighty companies around the world. Many of these legitimately continue to earn a profit, providing a self-sustaining source for the movement”*<sup>27</sup>. To date, estimates suggest the global efforts to hamper al Qaeda financing froze funds for \$147 million. As committed as this effort can be, its success can hardly be taken for granted. By the light of the limited amount of money required to reward the groups, working in this direction opens a series of challenges. Still, jamming the logic of contest does not require freezing all al Qaeda’s assets. What is important is to deny local groups access to these funds. Even if the network can count on an impressive fiscal autonomy, as valuable resources will always be available for the organization as a whole, counter-terrorist strategies may try to oppose it by making its resources of little utility. This can be done by breaking down the flow of money at the lowest level of the chain – i.e. before it gets in the local groups’ hands. If counter-terrorism will be able to deny them their economic reward, bin Laden’s credibility as a contest setter will be challenged.

## **Conclusion**

In the previous paragraphs, we attempted to apply the insights drawn from contest theory to explain some of al Qaeda’s most puzzling features. We suggested that one of its main strengths is given by the loose definition of membership. As witnessed by the plots unveiled in London and Glasgow in July 2007, terrorist actions look more like the result of self-starters’ initiatives than elaborated, centralized, top-down plans. This practice represents a departure from the past – and a truly problematic one. In fact, from a counter-terrorism perspective, the rise of autonomous violence-prone groups found Western intelligence basically unprepared. In the words of the British Intelligence and Security Committee’s Report *“We remain concerned that across the whole of the counter-terrorism community the development of the home-grown threat*

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<sup>27</sup> Kurth Cronin (2006 p. 37).

*and the radicalization of British citizens were not fully understood or applied to strategic thinking”<sup>28</sup>.*

Nonetheless, such an evolution of al Qaeda should not come as unexpected. On one hand, it is coherent with bin Laden’s “vanguardist” vision of the network – i.e. his leadership providing inspirational and ideological guidance to fellow Muslims willing to join the jihad all over the world. On the other hand, such a procedure is extremely appealing, as it allows terrorists to maintain a high level of secrecy concerning the organization, as well as to reduce the costs involved in terrorist attacks. In fact, by virtue of its loose and multiple ties, the network can survive and adapt even when some of its hubs are removed. Perhaps more importantly, this bottom-up process provides al Qaeda with a cheap and almost unlimited pool of human resources.

Fortunately, there are also some weaknesses implicit in this system that may be used to oppose al Qaeda. The logic of group competition inherent in contests makes sense only under given conditions, such as private and asymmetric information. Moreover, even if so far this process seemed to be self-sustaining, action can be undertaken in order to make its effects futile. As suggested in the previous paragraph, communication and financial rewards could be al Qaeda’s weakest points. Through a careful work of intelligence, links between nodes may be severely weakened, with the result of minimizing terrorists’ capabilities for large scale attacks. On the second front, counter-terrorism should track financial flows in order to prevent local groups from enjoying the reward for their action.

Needless to say, the insights suggested in our analysis are limited by the lack of reliable information on the network. Especially as concerns empirical evidence, we tried to draw some *ex post* observable implications. In other words, since no public confession or statement has been made by al Qaeda operatives on bin Laden’s rewarding strategy, we had to focus exclusively on the output of the process – obviously, al Qaeda’s attacks. As a consequence of this limit, several paths for future research are open. In particular, future analyses should investigate in depth the terms of the contest. How does bin Laden

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<sup>28</sup> Government Response to the Intelligence and Security Committee’s Report into the London Terrorist Attacks on 7 July 2005, May 2006.

initiate a contest? How does he select the participants to the contest? How does he reward the successful applicants – i.e. what is the weight of ideological blessing and monetary remuneration<sup>29</sup>? Is the contest played simultaneously, or do applicants play in sequence until bin Laden's goal is achieved? Finally, how to jam or deter this strategy?

Admittedly, these questions are beyond the limits of our analysis. Perhaps, addressing these questions will require a refining – let alone an amendment – of the interpretation presented here.

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<sup>29</sup> In fact, whenever the agents are partitioned into status categories according to their performance (top-class, low-class, and so on), a reasonable hypothesis is that the terrorist groups involved in this kind of contest care more about their relative 'status' than about the potential monetary reward. Social and cultural considerations connected to a concern for relative position do constitute important determinants affecting the performance of agents. This kind of behaviour can be strengthened in the presence of a deep ideological and religious motivation. See on this point Moldovanu, Sela, Shi (2007).



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