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# Characteristics of Terrorism

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## Abstract

Individual terrorists are frequently behaving seemingly absurd, e.g. by carrying out suicide operations, while activities of the terrorist organisations as a whole often seem to be conducted in a very effective way. These facts caused many researchers to regard the leaders representing the organisations like rational entities, while the followers are supposed to be just obeying and, hence, to be irrational.

In this paper we offer a different approach which postulates rationality of all involved agents. We demonstrate how these agents' behaviour could be modelled, while taking into account options of the terrorist leaders to influence their followers. From our model approaches to counter terrorism on both the leadership as well as the follower level can be derived.

**Keywords:** cognitive dissonance, joint production, Lancasterian characteristics approach, public goods, rationality, suicide attacks, terrorism

**JEL classification:** D74, D69

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## 1. Introduction

Many contributions to the literature on international terrorism postulate that there is some rationality associated with terrorist activity. Hence, the rational choice theory is applicable. Frequently rational behaviour is attributed to the terrorist organisation, e.g. represented by its leaders. Pape (2003: 344), who analyses suicide terrorism, argues: “Even if many suicide attackers are irrational or fanatical, the leadership groups that recruit and direct them are not.” And Lapan and Sandler (1988) investigate a bargaining situation between two agents: the terrorist group and the government.

The terrorist organisations or their leaders do not only have to develop strategies for conducting strikes (e.g. to make decisions on the execution of suicide attacks), but their duties go beyond. As Schelling (1991: 23) stresses: “whereas individual acts of terrorism may be easily within the capabilities of quite ordinary individuals, a sustained campaign on any scale may require more people and more organization than could be viable in most countries.” Organizations’ leaders have to manage the whole terrorist group, like an entrepreneur manages his company and this includes such basic duties like the acquisition of funds or the recruitment of supporters. The management of, e.g., fund-raising, requires comprehensive skills and also strategic planning.<sup>1</sup>

The analysis at the organisational level has some appeal: the organisation provides guidance and infrastructure to its supporters who in turn will execute strikes. Thus, it is the organisation which enables individuals to become effective terrorists. In order to prevent terrorist strikes, we have to learn more about and impede the organisation. If the organisation behaves rationally, its activities could be anticipated and consequently, appropriate countermeasures could be launched. As Abrahams (2004: 547) points out: “The good news [...] is that because terrorist groups are procedurally rational – that is, they try to make reasonable cost-benefit strategic calculations – governments can make better decisions on how to defend themselves.”

Yet, Pittel and Rübhelke (2006: 312) criticize that in approaches considering exclusively the leadership level as the decisive entity, the individual terrorist (the follower) is regarded “like an instrument without own will”, i.e. he/she just obeys the terrorist leaders’ orders without

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<sup>1</sup> Dishman (2001: 48-49) describes the case of the IRA, which had to seek new sources of revenue after the crackdown on its fundraising efforts in the USA. It made accessible new sources by pursuing organized crimes.

reasoning whether his/her behaviour is compatible with his/her personal goals. Hence, while the terrorist groups as a whole are supposed to function as rational actors, the individual supporters are supposed to be irrational. This is obviously an inconsistent treatment of the entities involved in terrorist activities and possible options to combat terrorism on the individual terrorist level will be ignored, if the analysis just focuses on the organisational/leadership level.

In contrast to approaches exclusively attributing rationality to the organisation represented by its leaders, Wintrobe (2006) does not restrict the rationality to the organisational level. He postulates: “rationality just means that, whatever the goal, a person chooses the best means to achieve it” (Wintrobe 2006: 170)<sup>2</sup> and this rationality is also applicable to the terrorist followers. And Caplan (2006: 105) who employs different concepts of rationality in his analysis of sympathizers, active terrorists and suicide terrorists, concludes: “The level of terrorism we observe is consistent with almost everyone being close to homo oeconomicus”.<sup>3</sup>

In this book chapter we support the view that not only terrorist leaders but also terrorist followers should be regarded as rational agents in the Wintrobean sense and like we do in all other fields of economics, although extremists may behave seemingly irrational. Otherwise we would have to partly reject the rationality assumption also, e.g. in consumer theory: Smokers seriously harm their health which seems to be irrational. However, there are aspects of smoking which – from the smoker’s point of view – may compensate even for his untimely death and hence the individual consumer is regarded to be rational. Likewise, the individual factory worker is not considered to be irrational per se, although he obeys compliantly the orders issued by the entrepreneur of the company. The salary which is paid is a visible compensation which may justify the obedience. In fact, there may also be compensations provided to a terrorist, although maybe less visible than a salary (and as invisible as the benefits from smoking).

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<sup>2</sup> Becker (1962: 1) postulates a similar definition: “now everyone more or less agrees that rational behavior simply implies consistent maximization of a well-ordered function, such as a utility or profit function.”

<sup>3</sup> “Psychiatrist Ariel Merari interviewed failed suicide terrorists and the families of suicide terrorists. He found that all attackers were psychologically healthy, and that none mentioned religiosity or promises of rewards in the afterlife as their main motivating force” (Berman and Laitin 2008: 1943).

Besides the top-down approach which considers terrorist activities from the perspective of a leader representing the organisation (top) which just issues orders to the obeying (irrational) individual supporter's level (down), an analysis which takes into account both leaders as well as the individual (non-leading) terrorists as rational agents is a reasonable alternative. A terrorist group will only function if the interplays between leaders and followers work and countermeasures should apply on both levels. Although we follow the suggestion by Wintrobe (2006) by distinguishing between terrorist leaders and followers, we employ three kinds of objective functions, since we additionally (to the ones for followers and leaders) introduce a function which is assigned by the supporters to the terrorist organisation. Hence, we assume that the objective function assigned to the terrorist organisation differs from the one of the leaders, who – since they are supposed to behave rationally – pursue at least partly goals which may not be congruent with the ones of the organisation.

In this book chapter we discuss and systematize different characteristics of terrorism. We describe how these characteristics might influence the agents involved in terrorist action. In doing so we take into account the influence the terrorist organization's leaders might exert on terrorist strike activities. Finally, we tentatively derive conclusions for adequate anti-terrorism policies.

## ***2. About Irrational Organizations and (Ir-)Rational Terrorists***

Subsequently, we give four examples for terrorists finally disobeying orders issued by their leaders. This shows that terrorists have in principle the capacity for making own decisions. Although it does not prove that they act rationally, it demonstrates that they are not just will-less creatures addicted to their leaders, but agents who can be influenced to become disobedient. This is important information, since it shows that countermeasures against terrorism at the follower-level may be successful.

After giving such examples of disobedience, we provide examples where terrorist leaders do not manage their organisations like rational entities, i.e. the target function of the organization is not properly reflected by the strategies and activities initiated by the leaders. We ascribe the discrepancies between rational leadership from the organisation's point of view and the observed behaviour of the leaders to the circumstance that leaders' personal goals and the organisation's goals (as they are taken for granted by the individual

supporters) differ. This justifies the distinction between the objective function of the organisation and the objective functions of its leaders.

### *Disobedient Terrorists*

In November 2008 gunmen attacked several targets in Mumbai. One of the gunmen was captured and in the subsequent interrogations he provided information to the police. He reported that he was ordered to kill until the last breath (Siddique 2008). Yet, instead he pretended to be dead in order to survive. Hence, he showed at least traces of own will by refusing the order to kill until the last breath.

In January 2008 two terrorists strapped with explosives stormed a five-star hotel in Kabul firing automatic rifles. While one of these men detonated his bomb, the second attacker finally took off his bomb vest and hid (Fairweather 2008). Consequently, the terrorist had the capacity to change his mind and hence, to reason about his actions, although he was radicalized in a madrasa where he initially sought some education (Fairweather 2008).

In 2004 Ahmed al-Shayea drove a truck bomb into Baghdad whose blast killed nine people. Although he initially was going to the Iraq for jihad, he was misguided over his truck-drive to Baghdad. In 2007 he publicly announced that he changed his mind about waging jihad, which he now disapproves (Abu-Nasr 2007).

The 2003-bombings in Istanbul caused more than 60 fatalities and many of the victims were Muslim Turks. According to one of the terrorists (who was later sentenced for life imprisonment), before the strikes took place, bin Laden approved the attacks in Turkey on condition that Turks were not killed (Davies 2003). Bin Laden suggested attacking the military base Incirlik, but finally the terrorists disobeyed by attacking different targets which were less protected than Incirlik (Guardian 2003). Due to the lower security standards of the chosen targets there was of course a lower risk for the individual terrorists of getting captured. The terrorists acted strategically by attacking weaker links (the less defended targets).<sup>4</sup> And they also (possibly without intention) made their choice of targets cleverly by simulating randomness: "As the authorities focus on a likely venue, the terrorists often strike

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<sup>4</sup> Otherwise terrorist organisations regularly support such weak-link strategies. As Moghadam (2003) shows, during the Second Intifada, the Palestinian terrorist organisations directed their suicide bombers mainly against civilian targets and less frequently against military ones.

elsewhere at less-watched targets” (Sandler 2003: 780). However, due to the killing of many Muslim Turks, Al Qaeda assessed the Istanbul-bombings to be failures.

### *(Ir-)Rational Leadership*

While individual terrorist may be able to execute rational decisions, sometimes activities of terrorist organisations seem to not properly reflect the postulated aims of the organisation (subsequently denoted “irrational representation” of the organisation). Abrahms (2004: 533) gives the example of suicide bombing in Israel, which has negative repercussions on the Palestinian population. If the Hamas aims to help the Palestinian people, terrorizing Israelis tends to be counterproductive, since the immediate consequence is a shut down of industrial zones in Israel and the sending back of Palestinians employed in the respective factories. Abrahms (2004: 533) raises the question who is hurt more by such suicide attacks, the Israelis or Palestinians themselves. However, it is difficult to assess what the precise target function of the Hamas is and maybe the Hamas considers the harm it imposes on the Palestinian people as a sacrifice which is necessary in order to achieve a superior aim (from its point of view) than helping the Palestinians to have a better quality of life.

A reason for an irrational representation of an organisation may be that the leaders are ill-minded or they just have also personal aims which are partly conflicting with the organisation’s aims. Miliora (2004) analyses the psychology of Usama bin Laden and draws the conclusion that three features of his personality are prominent: archaic narcissistic states, paranoia and a Manichean sense of reality. In case this diagnosis is right, would it then be possible that this leader conducts his organisation in a way that best serves exclusively the organisation’s aims? And even if the leader of a terrorist group would not be ill-minded, it is rather unlikely that his preferences are completely congruent with the ones of the group or organisation. As Rathbone and Rowley (2002: 4) point out: “The leaders of all successful terrorist groups are rational actors motivated by the maximization of some combination of expected wealth, power, fame and patronage, much in the way of other members of society.” If the leader would exactly pursue the organisation’s goals, he would not act rational in a personal sense and the question remains why he should do so. Let us exemplify this by the leader Yasser Arafat. Arafat was playing several different roles, e.g. he was the president of the Palestinian Authority (PA), chairman of the Executive Committee of



the Palestine Liberation Organisation (PLO), head of the Central Committee of the Fatah as well as the manager of his personal wealth. Gray (2005: 130) points out: "Arafat's autocratic and symbolic style of politics meant that he made little or no distinction between his own money and that of the PA." Abu Issa (2004) claims that Arafat and top PA officials did not respect law and many were corrupt. So, according to Abu Issa (2004), Arafat instructed his staff to divert donors' money to projects benefiting himself, his family, and his associates. Therefore, it seems that Arafat's personal goals were not completely congruent with the goals officially pursued by the organizations he led (among which is the Fatah that was involved in terrorist activity)<sup>5</sup>.

Consequently it would not be appropriate to assume that the leaders, who represent the terrorist organisation, guide the organisation exactly in the way that is best for the organisation and the pursuit of the organisation's aims. In this case leaders would behave irrational if they maximized the terrorist group's utility while disregarding their own interests (at least partly).

### *Three Different Objective Functions*

In order to escape the confusion, we suggest distinguishing between different kinds of objective functions: one for the terrorist organisation, which differs from the one of the leaders and the objective function of the leaders in turn deviates from the one assigned to the individual supporters of the organisation (the followers). Before we develop the individual functions, we take a closer look at the relevant characteristics of terrorist activities from the involved entities' points of view.

### **3. Characteristics of Terrorist Activity**

Economic theory regularly has to deal with goods or activities which are evaluated differently by individual agents. The construction of a nuclear power plant, for example, producing electricity with low greenhouse gas emissions may please people who are concerned about climate change. Yet, other people may be more concerned about the

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<sup>5</sup> Alone between September 2000 and June 2002, the Fatah and affiliated organisations such as the Tanzim and Al-Aqsa Martyrs have been responsible for suicide attacks which caused 42 Israeli fatalities and 629 casualties (Moghadam 2003: 82).

contamination risk associated with the use of nuclear power technologies and therefore not appreciate the construction of the power plant. Such activities or goods generate joint products; in the case of the construction of a nuclear power plant, at least two joint outputs are produced: On the one hand side, a good ('clean energy') of public wants is produced and on the other hand, an undesired bad ('contamination risk') is generated.

People may agree that a considered activity (operating a power plant) or good has some specific properties of its own, but for different persons different properties may be relevant and may vary in appreciation. In line with Lancaster (1966: 133; 1971: 6), those properties which are relevant to the choice of people will henceforth be denoted characteristics.

According to Lancaster (1971: 7) it is the characteristics of a good, not the good itself, in which agents are interested. Rübhelke (2005) suggests applying the characteristics approach developed by Lancaster (1971) to analyze problems associated with terrorism. Terrorist activities also provide different characteristics which are evaluated differently by different agents.

### ***3.1 Causes and Reasons***

According to Atkinson, Sandler and Tschirhart (1987: 5): "Terrorists often have multiple demands." There may be different motivations for getting involved in terrorism. Maikovich (2005: 373) stresses: "It is not the terrorist organizations' violent component that typically appeals to terrorists, but rather the sense of purpose and identity the organizations offer, as well as their purported central sociopolitical goals". More generally we distinguish between causes and reasons:

According to Kaplan (1978: 237), "*reasons* for an action are the purposes it is meant to serve". Such reasons are the terrorist organization's aims (e.g., the change of a political system). The pursuit of the reasons is a public characteristic to all supporters, since each of them benefits from the pursuit and promotion of the organization's aims and no supporter can be excluded from obtaining these benefits.

Furthermore, there are causes for terrorist activity. The causes for terrorist activity represent individual terrorists' aims (e.g., a terrorist intends to overcome his lack of self-esteem by means of his activity). The derived benefits are exclusively enjoyed by the

support-providing terrorist and, therefore, are private to the supporter. According to Kirk (1983: 42), causes are, in contrast to reasons, unobservable.

Consequently, an individual terrorist provides an observable public characteristic to all terrorist-organization supporters by conducting activities which support the reasons for terrorism, but simultaneously provides an unobservable private characteristic to himself (see Figure 1).

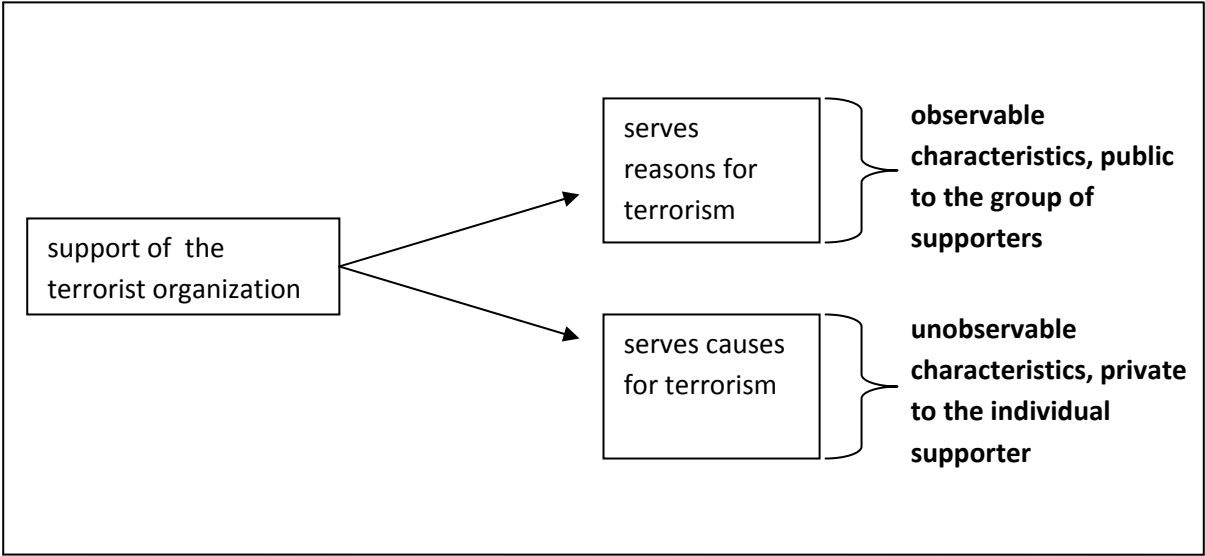


Figure 1: Terrorist activity serves causes and reasons.

Of course, people not supporting terrorist groups’ aims consider terrorist activity not as a public good,<sup>6</sup> but as a bad. Yet, since we intend to analyze the terrorists’ perspectives, we consider the characteristics of terrorist activity to be welfare enhancing (for the regarded terrorists).

**3.2 Impure Public Joint Production of Characteristics**

Since terrorist activities generate different properties of divergent degrees of publicness, they are impure public goods. Already Musgrave (1959: 13) referred to such kinds of goods: “Certain public wants may fall on the border line between private and social wants, where the exclusion principle can be applied to part of the benefits gained but not to all.” The relevance of impure public good approaches is extensive and many examples can be found

<sup>6</sup> Lancaster (1966: 132) points out: “goods are what are thought of as goods.”

in the scientific literature. Military activity of the NATO alliance has been characterized as yielding both private, country-specific, defence outputs and a pure public defence output (Murdoch and Sandler 1982; Sandler and Murdoch 1990; Sandler and Hartley 2001). Lee and Sandler (1989) analyze retaliation against terrorists and view retaliation as providing both pure public as well as private benefits.

Another field where the joint-production approach is regularly applied is philanthropy. This application has been first suggested by Cornes and Sandler (1984: 592) and Andreoni (1989) coined the expression of warm-glow giving in this context. The idea behind it is that people who donate for charity do not only generate a public characteristic but they also produce a very private characteristic, i.e. they enjoy a warm glow from the act of giving. Similar to the distinction between reasons and invisible causes in the terrorist context, we may classify the support of charity as the reason for the donation and the 'warm glow' as an invisible cause. Kapur (2002) argues that the World Bank provides public goods such as international development along with private benefits, such as serving the strategic interests of its key shareholders. Other impure public goods investigated in the scientific literature are e.g. climate protection (Sandler 1996; Rübhelke 2003), environmentally friendly consumption (Kotchen 2005) and refuse collection (Dubin and Navarro 1988).

The private output of the joint production improves the impure public good's production prospects. "This follows because the jointly produced private output can serve a privatising role, not unlike the establishment of property rights" (Cornes and Sandler 1984: 595). Hence, the private merits individual terrorists derive from pursuing the causes of their terrorist activity mitigate the free-rider incentives within terrorist groups.

#### ***4. How Can the Leaders Influence the Followers?***

The relationship between things and people is at least a two-stage affair: "It is composed of the relationship between things and their characteristics (objective and technical) and the relationship between characteristics and people (personal, involving individual preferences)" (Lancaster 1971: 7). At both stages the leader can apply his influence in order to guide the individual terrorist or follower (see Figure 2).

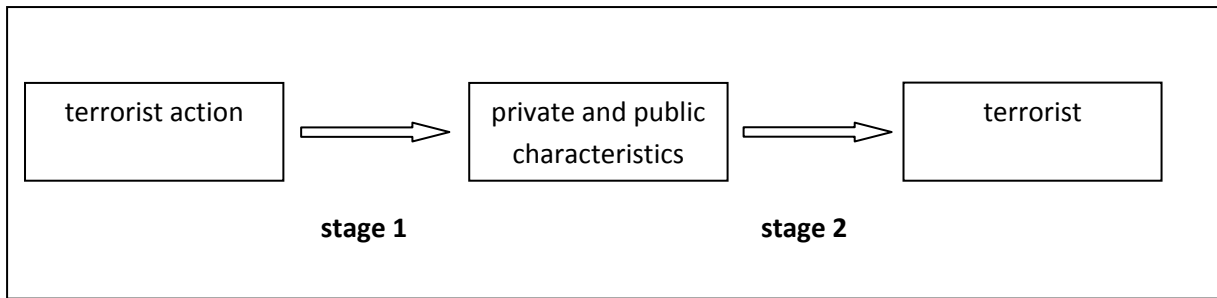


Figure 2: Relationship between terrorist activity and terrorists.

The leader may improve the effectiveness of terrorist action in pursuing the organization's objectives, which is an influence exerted at stage one. This improvement will have an effect on the relationship between things (terrorist action) and their characteristics (the serving of the terrorist's objectives). If there is a higher level of terrorist characteristics (in the context of the pursuit of causes and reasons) produced by a given amount of terrorist activity, this will benefit the terrorist agents. We can distinguish between the leader's influence on 1) the level of public characteristics and 2) the level of private characteristics.

The leader can also apply his influence at stage two by modifying outer circumstances, which in turn affects the relationship between characteristics (the serving of the terrorist's objectives) and people (terrorists). By influencing beliefs, he can change conditions in such a way that the individual terrorist assigns a higher weight to the reasons for terrorist activity.

In the subsequent subsections we reverse the order of issues and start with the discussion of the influence options on the second stage.

#### ***4.1 Second Stage: Influencing Beliefs***

Leaders can influence followers' beliefs such that their identification with the organisation rises and they successively adopt the organisation's objectives, i.e. the relationship between terrorists and the characteristics of terrorism is affected. A way of exerting such influence is to reduce the cognitive dissonance of terrorist followers as we will outline subsequently. The leader's investments in such influences are represented by investments in  $\psi$  in Section 5.1.

"It is costly to ascertain objectively the different states of the world. To minimize these costs, individuals form beliefs over those states of the world that are of relevance to them. These beliefs then serve as a basis for making decisions" (Breton and Dalmazzone 2002: 46). And as

Akerlof and Dickens (1982: 307) explain, people have some control over their beliefs and can manipulate their own beliefs by selecting sources of information which tend to confirm desired beliefs. There is a benefit from believing in desired beliefs, although these beliefs may be misleading and may cause costly judgement errors.

Worries about beliefs/decisions are largely suppressed, in order to mitigate cognitive dissonance.<sup>7</sup> According to Dickens (1986: 97), psychological studies of cognitive dissonance suggest that a person's worries about his decisions are unpleasant and that he resolves these worries by systematically altering his beliefs to convince himself that his decisions are correct.<sup>8</sup> Cameron (1988: 307) denotes the cost imposed by such worries "psychic costs".

In the case of terrorism the follower may choose extreme beliefs which are in line with the organization's views. This will improve his readiness to support the group and the group, in turn, will pay tribute to the extremist. Due to the positive feedback of the group, the extremist obtains a benefit from choosing the extreme beliefs. Therefore, it might be desirable for the follower to hold such beliefs. However, these beliefs and the actions based on these beliefs will also bring about cost. These costs may arise from feelings of guilt, from having doubts or from risks to the individual extremist, e.g. the risk of being sent to prison, but the terrorist tends to downplay and underestimate the respective costs in order to mitigate the cognitive dissonance.<sup>9</sup>

With respect to the case of extremist beliefs Hardin (2002: 10) stresses that such beliefs can be protected by keeping the extremist in the company only of others who share the desired beliefs. This isolation helps to reduce dissonant cognitions and to harden his beliefs. The extremist will be induced to perceive people, who are outside his extremist group, as hostile to him. This in turn will harden his judgement of other groups. Simultaneously, the ties within his group become tightened, so that the terrorist will feel more belonging to the terrorist organization.

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<sup>7</sup> Aronson and Carlsmith (1962: 178) point out: "The most common method of reducing dissonance is to change or distort one or both of the cognitions, making them more consistent (consonant) with each other."

<sup>8</sup> Kopczuk and Slemrod (2005) apply an idea which is conceptually similar to this cognitive dissonance approach and regard a forward-naive individual who appreciates the benefits of reduced fear by the denial of death but does not recognize the implications of repression for her future behaviour.

<sup>9</sup> Sanico and Kakinaka (2008) develop a model in which individual terrorists' welfare depends amongst other things on the risk associated with terrorism.

Therefore, one option for terrorist leaders to strengthen the ties between individual terrorists and the terrorist organization is to help reducing dissonant cognitions by intensifying the isolation of the terrorists. A way to pursue such an isolation strategy is to keep away information from outside that would challenge the group's beliefs.

Isolation efforts have already been made by, e.g. the Assassins (or Ismailis-Nizari) in the period 1090-1275. They seized several scattered and impregnable mountain fortresses as retreat centres for their movement. "Isolation gave the Assassins both the space and the time required to create a quasi-monastic form of life and to train leaders, missionaries, and fidayeen" (Rapoport 1984: 666). Also the Al Qaeda encourages the training of its supporters in hidden camps. According to Leheny (2005: 100) such "[M]ilitary training camps generated both the common collective identity and the shared tactics and repertoires that have informed the transnational cells". Hegghammer (2006: 46) stresses the crucial role of training camps in radicalization processes and specifies four important and interlinked processes which recruits undergo in such camps: "violence acculturation, indoctrination, training and relations-building."

Pittel and Rübhelke (2006: 314) give the example of the extremist organization Aum Shinrikyo which also sought isolation of its members. This group constructed nuclear shelters and communes where its members could escape worldly distractions. Members were separated from their families and children received no formal schooling. The hierarchic structure of the group was based on ascetic attainment. Among the crimes committed by this group was the Tokyo sarin gas attack on March 20, 1995.

An isolation-strategy is also pursued by many legalistic or allegedly legal organisations like the "Islamische Gemeinschaft Millî Görüş e.V." (IGMG), which claims to have 87,000 members Europe-wide. With estimated about 27,000 members it is the largest Islamist organisation in Germany. Its activities focusing on the conservation of an 'Islamic identity' may reinforce the disintegration of its supporters in Western Societies and may contribute to the establishment of Islamic parallel lives and to the radicalisation of its members (Bundesamt für Verfassungsschutz 2007: 5). Summer schools and seminars for young supporters intend to establish a disassociation of the participants from their peers in Western societies (Bundesministerium des Innern 2008: 227-232). At least partly, the IGMG's provision of education targets on the disaffirmation of democratic institutions and

tends to create prerequisites for the life in accordance with the sharia (Bundesamt für Verfassungsschutz 2008: 8-9).

Yet, there are further options for terrorist leaders to influence the compliance of terrorist followers. Maikovich (2005: 380) outlines how organisational characteristics contribute to minimizing the occurrence of cognitive dissonance among terrorist groups' members. She refers to Festinger (1957), who argues that individuals will often attempt to reduce dissonance in one or more of three ways, which are 1) removing dissonant cognitions, 2) adding consonant cognitions and 3) decreasing the importance of dissonant cognitions (Festinger 1957: 264). A fourth way can be added, which is the increase in the importance of consonant cognitions (Harmon-Jones and Mills 1999: 5). The terrorist leaders can help to remove dissonant cognitions by keeping terrorists in isolation, as discussed above. Concerning the addition of consonant cognition, the reduction of the importance of dissonant cognitions and the rise in the importance of consonant cognitions the provision of selective information is crucial. According to Maikovich (2005), the addition of consonant cognitions can be supported by legitimizing the use of drastic means to fight unjust governments and their people. She argues that the importance of dissonant cognitions can be reduced by de-emphasizing "doubts about violence because of the importance of an ideal society". The rise in the importance of consonant cognitions can be pursued by making a situation seem urgent.

Al Qaeda distributes respective propaganda via videos on the internet and uses the medium internet also in other ways, e.g. it orchestrated an online chat between Ayman al-Zawahiri, which is the deputy leader of Al Qaeda, and curious people around the globe (Whitlock 2008).

The allegedly legal organisation IGMG spreads information to influence its supporters via, e.g. the European issue of the newspaper Millî Gazete (which is formally an independent Turkish newspaper) and the IGMG-homepage.

#### ***4.2 First Stage: Influencing the Level of Public Characteristics***

The terrorist leaders can influence the level of terrorist characteristics (in the context of the pursuit of causes and reasons) produced by a given amount of terrorist activity. The higher



the level of terrorist characteristics generated given a specific quantity of terrorist input, the larger tend to be the benefits enjoyed by the terrorists.

The leader can induce a more effective pursuit of reasons by providing support to individual terrorists in conducting strikes. The more efficient the leader's management activities and support, the more effective is the follower's activity (with respect to the pursuit of reasons). The leader's investments in such a support are represented by investments in  $\beta$  in Section 5.1.

According to Pape (2003: 2): "The vast majority of suicide terrorist attacks are not isolated or random acts by individual fanatics but, rather, occur in clusters as part of a larger campaign by an organized group to achieve a specific political goal." Hence, guidance by the organisation represented by its leaders is observable. As an indication that leaders' influence and management matters with respect to the effectiveness, e.g. the amount of fatalities caused by one strike, of their followers' activities, serves the example of Palestinian terrorist groups. Moghadam (2003: 79) analyses the activities of different Palestinian terrorist groups during the Second Intifada and finds that the Hamas is more effective in killing Israelis by means of suicide attacks than the Fatah. He finds, e.g. for the second quarter of 2002, that Hamas managed to kill over twice as many Israelis (43 fatalities) as did Fatah (18 fatalities) with only 3 suicide attacks compared to 6 by Fatah. Not only the number of victims might be important, but also their nationality. According to Pape (2005), since 2002, the Al Qaeda "has killed citizens from 18 of 20 countries that Osama bin Laden has cited as supporting the American invasions of Afghanistan and Iraq." Also the level of public attention raised by one strike can be employed as a measure of effectiveness. As Wilkinson (1997: 52) points out: "In the process of attempting to spread terror among a wider target group some channel or medium of transmitting information [...] will inevitably be involved." Rapoport (1984: 665) reports on the Assassins, who "did not need mass media to reach interested audiences, because their prominent victims were murdered in venerated sites and royal courts, usually on holy days when many witnesses would be present."

Yet, the involvement of mass media and the internet further improves the spread of information and hence increases the reach of terror. The chance to raise the mass media's attention tends to be the better, the more spectacular a terrorist strike. The leaders can select attractive targets in order to improve the publicity impact.

However, there may also be another rationale for the guidance in the selection of targets. Such a rationale played a role when Al Qaeda strategists influenced the target selection by the terrorists who accomplished the 2004-Madrid bombings. The Al Qaeda identified Spain as a weak link in the US-led coalition in Iraq since a majority of Spaniards was against the Iraq-war. An Al Qaeda strategy paper, which was already found in 2003 by researchers of the Norwegian Defence Research Establishment, stressed that attacks in Spain immediately before the Spanish 2004-elections would be an effective means to force a retreat of Spanish troops from Iraq. On the 11<sup>th</sup> of March 2004, indeed attacks took place, which was shortly before the elections. Multiple bombings caused 191 fatalities and 1,876 casualties. Due to the smart guidance by the leaders, the terrorist strikes in Spain had a significant impact on reaching the terrorist organization's aims in the shape of weakening the international military coalition in Iraq.

Also the proper selection of activists may affect the success of action. Schweitzer and Goldstein-Ferber (2005: 36) describe Al Qaeda's selection process of members. The organisation tries to identify candidates with exceptional talents and useful skills, but they also have to be unknown as Al Qaeda operatives in order to prevent an early identification of prospective attackers. Hence, Al Qaeda executes a selection of candidates which raises the likelihood of successful attacks.

#### ***4.3 First Stage: Influencing the Level of Private Characteristics***

A rewarding scheme within the organisation may contribute to improving the effectiveness in pursuing causes. The leader's investments in improving the rewarding scheme are represented by investments in  $\alpha$  in Section 5.1.

If we regard the want of appreciation as a cause for joining in terrorist activity, strategies of idolising active terrorists raise the appreciation for a given level of activity and hence tend to raise the attractiveness of terrorism.

According to Schweitzer and Goldstein-Ferber (2005: 35), the Al Qaeda takes advantage of specific developmental characteristics of young Muslims and endows supporters with two assets: 1) a sense of heroism accompanied by a sense of power and 2) the feeling that in their frequent visits to mosques, they choose the path of jihad on their own, without

coercion. And he outlines that leaders like bin Laden personally showed up in training camps and conducted conversations with individual candidates. These candidates got regard which was probably lacking before in their lives.

Furthermore, Schweitzer and Goldstein-Ferber (2005: 36) stress that not every candidate will be accepted to become a member of Al Qaeda. It is reasonable to assume that successful candidates will perceive a rise in their self-esteem.

Yet, rewarding schemes of terrorist groups tend to be diverse. Alvanou (2007: 86) analyzes a very extreme form of terrorism: suicide bombing by females. She remarks: "Palestinian women may be accepted to explode themselves, but it seems as if death is the only dimension they can claim and enjoy equality in." Alvanou (2007: 75-76) gives the example of suicide bomber Wafa Idris who was marginalised in the Palestinian society and who seems to have seen the only way to restore her reputation and name in conducting a suicide attack. Hence, following this argumentation, in the extreme cases of socially marginalised women appreciation is only provided for suicide attacks.

## ***5. The Model***

In this section we illustrate how the different characteristics and the influence exerted by the leaders can be integrated in an analytical approach describing terrorist actions.

Based on the approach suggested by Wintrobe (2006) which allows for changing objective functions, Pittel and Rübhelke (2006) already suggest a model which integrates reason and causes as motivations for terrorist activity. In this model and in line with Wintrobe's approach, terrorists dedicate themselves to terrorism and simultaneously give up their autonomy. An individual terrorist is supposed to attach a positive value to his autonomy on the one hand, but on the other hand also to the solidarity the terrorist organization provides to him due to his terrorist support. In this sense the terrorist trades autonomy for solidarity. As Wintrobe argues, a terrorist's utility additionally depends directly on the utility of the terrorist organization as represented by its leader. The integration of the leader's preferences into the utility function of a terrorist induces the terrorist to choose a higher level of solidarity than he would if the leader's preferences were of no importance to him.

In contrast to Wintrobe's approach, Pittel and Rübhelke (2006) explicitly take account of the fact that terrorist support is an impure public good from the individual terrorist's point of view. Furthermore, they consider two influence options of the leader to manipulate the individual terrorist and show that the influence mechanisms do not represent perfect substitutes. In contrast to their analysis, the subsequent model regards three different influence mechanisms. We consider the leaders' influence on the level of private and public characteristics as well as the influence on beliefs.

### 5.1 The Individual Terrorist

In line with Cornes and Sandler (1984: 581), we define the considered agent's utility function over three characteristics. More precisely, the representative terrorist (or follower)  $i$ , with  $i=1, \dots, n$ , is assumed to derive utility from private good consumption  $y_i$  and terrorist support activities  $s_i$ . On the one hand, these support activities generate the public characteristic  $x$ . On the other hand,  $s_i$  also generates a private characteristic  $z_i$ , i.e. the private satisfaction derived from terrorist activities. We will assume that this is represented by appreciation by the terrorist group which in turn reinforces the terrorist's feeling of belongingness to the organization. The individual terrorist  $i$  initially faces an *autonomous utility function*:

$$U_i(y_i, s_i) = U_i(y_i, z_i, x) \quad (1)$$

where  $U_{ik} = \frac{\partial U_i}{\partial k} > 0$ ,  $U_{ikk} \leq 0$ ,  $k = y_i, z_i, x$ . For the total amount of the public characteristic  $x$  it holds:  $x = x_i + x_{-i}$ , i.e. the total amount of the public characteristic is the sum of agent  $i$ 's provision  $x_i$  and all other agents' provision  $x_{-i}$ .

The technologies by which the terrorist support  $s_i$  is translated into the two characteristics  $z_i$  and  $x_i$  can be described as follows

$$z_i = \alpha \beta s_i, \quad (2)$$

and

$$x_i = \beta s_i, \quad (3)$$

with  $0 \leq \alpha$  and  $\beta > 0$ . Therefore, one unit of  $s_i$  produces  $\alpha\beta$  units of the private characteristic  $z_i$  and  $\beta$  units of the public characteristic  $x_i$ . The levels of  $\alpha$  and  $\beta$  are determined exogenously (from the follower's point of view) by the leader's investments in  $\alpha$  and  $\beta$  respectively.

The term  $\alpha\beta$  measures the amount of the organisation's provision of  $z_i$  in exchange for terrorist support  $s_i$ , which can be influenced by the leaders (e.g. by raising the idolisation of members) as we discussed in Sections 4.2 and 4.3. The appreciation perceived by the terrorist depends on three factors: the level of activity, the effectiveness of the action in pursuing the reasons for terrorism ( $\beta$ ) as well as the effectiveness in pursuing the causes for terrorism ( $\alpha$ ). This implies that terrorists, who are more successful in pursuing the organisation's objectives, tend to enjoy higher levels of appreciation.

The level of  $x_i$  depends on the level of activity as well as on the parameter  $\beta$ , the effectiveness of the attainment of the terrorist organisation's objectives (or the pursuit of the terrorist organisation's reasons for terrorist activity). The leader can influence  $\beta$  by providing efforts in managing and conducting support in an effective way as we discussed in Section 4.2.

The incentive of the terrorist leader to invest in  $\alpha$  and  $\beta$  is his expectation that this investment will induce the terrorist to provide more  $s_i$  and thereby also  $x_i$  which increases the leader's utility (see Subsection 5.2). It is assumed that by influencing  $\alpha$  and  $\beta$ , the leader exerts the same effects on each terrorist, i.e. we suppose that  $\alpha_i = \alpha$  and  $\beta_i = \beta$ .

Due to his terrorist action  $s_i$  the follower receives appreciation  $z_i$  which in turn raises his feeling of belongingness to the terrorist organization. The rise in the feeling of belongingness induces the terrorist to - at least partially - adopt the postulated preference structure of the terrorist organization. Therefore, the individual terrorist will include the perceived utility function of the leader, who represents the organisation, in his welfare function. Each individual terrorist is assumed to postulate that the utility function of the organization or its leader (now denoted *perceived utility function of the leader*  $U_{LP}$ ) has the following shape

$$U_{LP} = U_{LP}(x) \quad (4)$$

where  $U_{LPx} = \frac{\partial U_{LP}}{\partial x} > 0$  and  $U_{LPxx} < 0$ . The individual terrorist's welfare function is a composite of the function he would pursue if he were completely autonomous (which is (1)) as well as of the perceived utility function of the leader (which is (4)).

Therefore, the overall utility level enjoyed by a single terrorist is determined by the following function (to which we will refer henceforth as *welfare function*)

$$W_i(U_i, U_{LP}) = b_1 U_{LP}(x) + b_2 U_i(y_i, z_i, x) \quad (5)$$

whereby the weights  $b_1$  and  $b_2$  attached to either (sub-)utility function are endogenously determined. The leader can directly influence the relative weight attached to the utility function  $U_{LP}$  by investing in  $\psi$  as discussed in Section 4.1. Raising  $\psi$  by manipulating the individual terrorist's beliefs induces an increase in the weight a terrorist attaches to the perceived leader's utility in comparison to his autonomous utility. Consequently, the weight the terrorist attaches to the perceived utility function of the leader depends on both the amount of  $z_i$  received as well as  $\psi$ .

Summing up, the feeling of belongingness can be reinforced by the leader via two channels: by manipulating beliefs in a way that they are more in line with the organisation's interests (affecting  $\psi$ ) as well as by raising the appreciation of the terrorist action (affecting  $z_i$ ). However, we suppose that it is not the absolute level of  $z_i$  which matters with respect to the weight, but its relative importance. As a reference value for this relative importance let us take the sum of his production of private and public characteristics  $c_i = z_i + x_i + y_i$ .

More elaborated, the welfare function takes the following shape:

$$W_i(y_i, z_i, x) = \psi \frac{z_i(\alpha, \beta)}{c_i(\alpha, \beta)} U_{LP}(x) + (1 - \psi) \frac{x_i(\beta) + y_i}{c_i(\alpha, \beta)} U_i(y_i, z_i(\alpha), x(\beta)) \quad (6)$$

It is assumed that this additive welfare function satisfies the standard assumptions. Terrorist activity has several effects on the welfare function (see Figure 3). It affects the autonomous utility via the private and public characteristics generation directly. Furthermore, it enters the terrorist's welfare function via the integrated perceived utility function of the leader, which is a function of the public characteristic. Finally, the support also has an influence on the terrorist welfare function by influencing the weights of the perceived utility function of the leader as well as of his autonomous utility function.

Equation (6) shows that the leader has three instruments in order to influence the followers: he can invest in manipulating  $\alpha$ ,  $\beta$  and  $\psi$ . The individual instruments affect  $W_i$  differently: By increasing  $\alpha$ , the leader directly increases  $z_i$  for any given  $s_i$ . This exerts an effect on the autonomous utility of the agent,  $U_i$ , and besides also increases the weight attached to the leader's utility in  $W_i$ . Increasing  $\psi$  on the other hand raises the relative weight attached to  $U_{LP}$  only. By manipulating  $\beta$ , the leader influences the level of  $x$  directly for any given  $s_i$ .

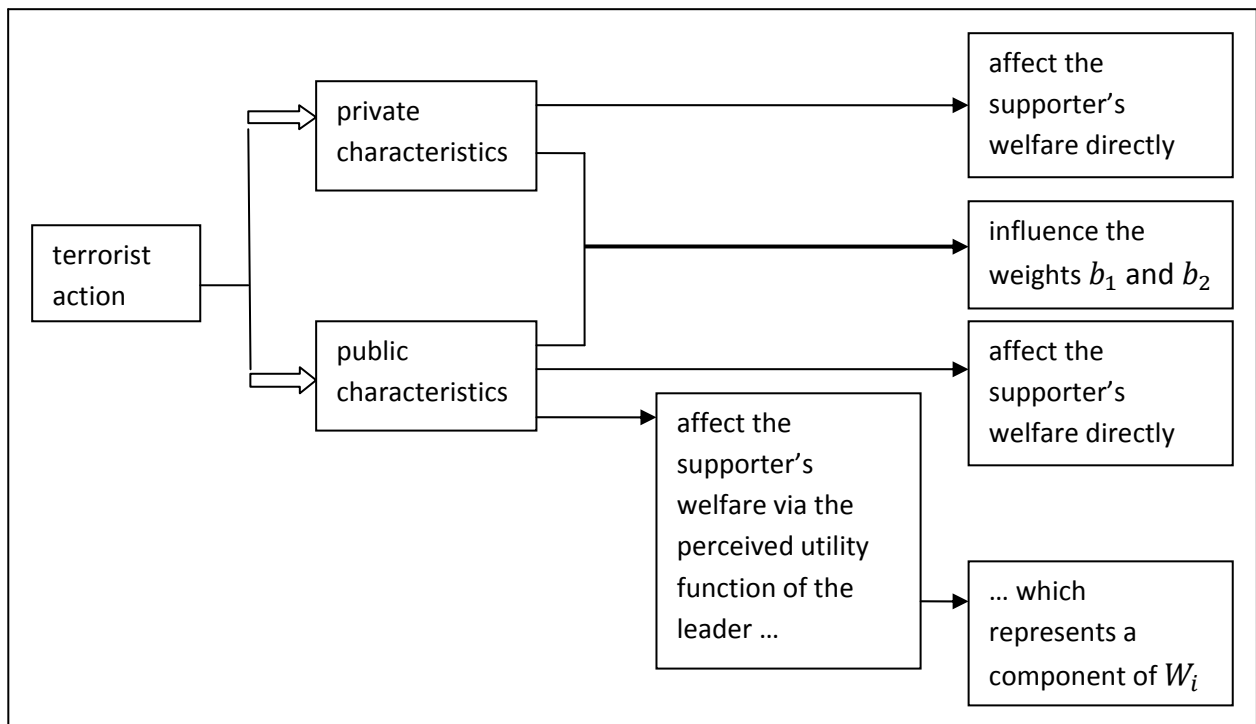


Figure 3: Welfare Effects of Characteristics.

This in turn affects both the autonomous utility of the terrorist,  $U_i$ , and the perceived utility function of the leader,  $U_{L,P}$ . Furthermore, the values of the weighting factors  $\frac{z_i(\alpha,\beta)}{c_i(\alpha,\beta)}$  and  $\frac{x_i(\beta)+y_i}{c_i(\alpha,\beta)}$  change.

We postulate that the individual terrorist receives an exogenously given income  $I_i$  which he can either spend on private good consumption or on terrorist action. Hence, his budget constraint is given by

$$I_i = p_s s_i + y_i \quad (7)$$

where the unit price of  $y_i$  is normalized to unity, while the unit price of support is  $p_s$ . The technologies translating  $s_i$  into the characteristics  $z_i$  and  $x_i$  are described by equations (2) and (3). Regarding the private good consumption  $y_i$  it is assumed that each unit of this good generates one unit of a private characteristic (different to the private characteristic produced by  $s_i$ ). Therefore,  $y_i$  denotes the amount of the terrorist's private good consumption as well as the amount of private characteristics produced by this consumption.

Maximization of (6) subject to (7) yields the first-order conditions with respect to  $s_i$  and  $y_i$  which can be rewritten as:

$$\beta \frac{[c_i(1-\psi)(y_i+x_i)(U_{ix}+\alpha U_{iz_i})]+[\psi c_i z_i U_{Lpx}]+[\alpha y_i(\psi U_{LP}-(1-\psi)U_i)]}{[(1-\psi)(y_i+x_i)c_i U_{iy_i}]+z_i[(1-\psi)U_i-\psi U_{LP}]} = p_s \quad (8)$$

This condition simply states that the marginal rate of substitution has to equal the relative price in the optimum. Multiplier  $\beta$  and the numerator of (8) reflect altogether four channels through which the terrorist support  $s_i$  affects the optimal allocation of income between  $s_i$  and  $y_i$ , while the denominator shows the two effects of  $y_i$  on the optimal allocation.

The first term (in square brackets) in the numerator gives the *direct* effect of  $s_i$  on the autonomous level of utility  $U_i$  via  $z_i$  and  $x_i$ . The other two terms in the numerator show the indirect effects of  $s_i$ . Firstly, the individual terrorist activity serves the postulated leader's objectives and raises the leader's utility level. Since the perceived utility function of the leader is a component of the individual terrorist's welfare function, the leader's welfare increase also translates into an increase in the individual terrorist's welfare (second term in the numerator: *first indirect effect*). Secondly, a change in  $s_i$  also affects the weight attached to the autonomous and leader's utility in the terrorist's welfare function (third term in the numerator: *second indirect effect*).

When comparing the effects of a change in terrorist support on the optimal allocation with the effects of a change in private good consumption, it can be seen that especially one effect is missing with respect to  $y_i$ : As  $y_i$  is generating solely a private characteristic, it has no effect on the leader's utility, i.e. it does not produce the *first indirect effect*. With respect to the *second indirect effect* (second term in the denominator) it should be noted the sign of this term is reversed compared to the sign of the second indirect effect of  $s_i$ : The rise in  $y_i$  increases the weight attached to the autonomous utility while the relative importance of the leader's utility declines.

The reaction function of terrorist  $i$  can now be obtained from inserting the budget constraint (7) into (8) and solving with respect to  $s_i$  which gives  $s_i = s_i(\alpha, \beta, \psi, y_i)$ . Aggregating over all terrorists we denote the aggregate provision of  $s$  by  $s(\alpha, \beta, \psi, y_i, \dots, y_n)$ .



## Comparative Statics

As already indicated, we assume the leader to be able to influence the terrorist by investing in the effectiveness of the attacks ( $\beta$ ), the influence of beliefs ( $\psi$ ) and the terrorist's private satisfaction from the attack ( $\alpha$ ). In deciding about the optimal level of these three variables, the leader will not only consider his own preferences, but also take the reaction of the terrorist onto account. This reaction can be derived by differentiating the marginal rate of substitution  $MRS_i$ , i.e. the term on the LHS of (8), with respect to  $\psi$ ,  $\alpha$  and  $\beta$ :<sup>10</sup>

$$\left. \frac{\partial MRS_i}{\partial \psi} \right|_{s_i, y_i} > 0 \quad (9)$$

$$\left. \frac{\partial MRS_i}{\partial \alpha} \right|_{s_i, y_i} \geq 0 \quad (10)$$

$$\left. \frac{\partial MRS_i}{\partial \beta} \right|_{s_i, y_i} \geq 0 \quad (11)$$

With respect to  $\psi$ , an increase in the leader's investment induces a rise in the marginal rate of substitution for any given  $s_i$  and  $y_i$ . As the transformation rate between  $s_i$  and  $y_i$  (i.e. the price ratio) remains constant, this rise will be offset by an increase of terrorist support relative to private good consumption. The intuition behind this is that the increase in  $\psi$  increases the importance of the leader's perceived utility for the terrorist. As the leader derives utility from the level of terrorist activities, but not from the individual terrorist's private consumption, this increase in the weight of  $U_{Lp}$  implies that the individual terrorist now receives a higher marginal utility from investing in  $s_i$ , such that he substitutes  $s_i$  for  $y_i$ .

Expression (9) implicitly gives us the reaction of an individual terrorist to an increase in  $\psi$ , i.e.,  $\frac{ds_i}{d\psi} > 0$ . Due to the assumption that all terrorist are identical this implies:  $\frac{ds}{d\psi} > 0$ .

With respect to  $\alpha$  matters are a little more complicated. An increase in  $\alpha$  on the one hand has a similar effect as an increase in  $\psi$  as it raises the weight of the leader's utility in (6). As the case for  $\psi$ , this effect alone ('weight effect') would lead to a substitution out of  $y_i$  and into  $s_i$ . Yet an increase in  $\alpha$  also induces an increase in the autonomous utility level for any given  $s_i$  and  $y_i$  as the terrorist now receives more of the private characteristic per unit of  $s_i$ . This increase in  $U_i$  in itself may induce a substitution out of  $s_i$  and into  $y_i$  ('direct utility effect'). Yet, the effects may even cause a rise in the provision of terrorist support. This is

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<sup>10</sup> The precise terms are provided in the Appendix.

due to the complex interrelations in an impure public good model as has been illustrated by Cornes and Sandler (1994). Depending on the properties of the direct utility effect and on whether the weight effect or the direct utility effect dominates,  $s_i$  might increase, stay constant or even fall due to an increase in  $\alpha$ . For the reaction of the aggregate level of terrorist activity we get accordingly  $\frac{ds}{d\alpha} \gtrless 0$ .

Finally, consider the comparative statics of  $\beta$ . Changing  $\beta$  induces two types of effects: It directly affects the success of terrorist activities, i.e.  $x$ , but also exerts an indirect effect on the private recognition a terrorist gets from an attack, i.e.  $z_i$ . In our model, the latter leads to the same reaction of the marginal rate of substitution as changes in  $\alpha$ . Additionally, however, a rise in  $\beta$  increases the provision of the public good for any given level of  $s_i$  and therefore also the agent's autonomous utility as well as the leader's perceived utility. A rise of  $\beta$  also increases the weight of the leader's perceived utility and decreases the weight the terrorist attaches to his autonomous utility. As the case for  $\alpha$ , the direction in which terrorist's react to changes in  $\beta$  depends on the relative importance of weight and utility effects, i.e. on the preference structure of the agent.

## 5.2 The Terrorist Leader

When assuming that the leader's utility matters for the terrorist, we argued that the terrorist only considers satisfaction that the leader derives from the terrorist's own and the other terrorists actions. This, we labeled the *perceived* utility of the leader,  $U_{Lp}$ . This perceived utility, however, has to be clearly distinguished from the *true* utility function of a leader,  $U_L$ . As an individual, the leader also derives utility not only from aggregate terrorist activities  $x$  but also from private consumption,  $y_L$ . His welfare function is therefore given by

$$U_L = U_L(y_L, x) \quad (12)$$

where  $U_{Ly_L} > 0, U_{Ly_Ly_L} < 0, U_{Lx} > 0, U_{Lxx} < 0$ . The leader receives a monetary income  $I_L$  that he allocates between private consumption and the instrumental variables  $\alpha$ ,  $\beta$  and  $\psi$ . His budget constraint is given by:

$$I_L = y_L + p_\psi \psi + p_\alpha \alpha + p_\beta \beta \quad (13)$$

with  $p_\psi$ ,  $p_\alpha$  and  $p_\beta$  denoting the unit costs of the instrumental variables in which the leader invests to foster terrorist activities.

When determining his optimal investment in the instrumental variables, the leader knows the feedback effect this investment has on the provision of the public characteristic by all terrorists, i.e., the leader considers the aggregate reaction function  $s(\cdot)$ .

The leader maximizes (12) subject to (13) which gives the first-order conditions for  $y_L$ ,  $\alpha$ ,  $\beta$  and  $\psi$ . Combining these conditions we get six relations that equalize the marginal rates of substitution between any two variables to the respective price ratio:

$$\begin{aligned} p_\psi &= n \frac{U_{Lx} \beta \frac{ds_i}{d\psi}}{U_{LyL}}, & p_\alpha &= n \frac{U_{Lx} \beta \frac{ds_i}{d\alpha}}{U_{LyL}}, & p_\beta &= n \frac{U_{Lx} (\beta \frac{ds_i}{d\beta} + s_i)}{U_{LyL}}, \\ \frac{p_\alpha}{p_\psi} &= \frac{\frac{ds_i}{d\alpha}}{\frac{ds_i}{d\psi}}, & \frac{p_\beta}{p_\psi} &= \frac{\beta \frac{ds_i}{d\beta} + s_i}{\beta \frac{ds_i}{d\psi}}, & \frac{p_\beta}{p_\alpha} &= \frac{\beta \frac{ds_i}{d\beta} + s_i}{\beta \frac{ds_i}{d\alpha}}. \end{aligned} \quad (14)$$

In an interior equilibrium all of these relations have to hold simultaneously.

Equations (14) describe the trade off between investment in the instrumental variables versus spending on private consumption as well as the trade off between investment in the different instruments. While the leader gets direct satisfaction from private consumption, his return to investment in the instrumental variables  $\alpha$  and  $\psi$  only yields an indirect return from the induced reaction of the terrorists,  $n \frac{ds_i}{dj}$ ,  $j = \alpha, \psi$ . It is obvious that investment in  $\alpha$  and  $\psi$  can only be optimal for the leader if it increases  $s_i$  and thereby  $x$ . So, in equilibrium  $\frac{\partial MRS_i}{\partial \alpha} < 0$  can never hold.

In contrast to investment in  $\alpha$  and  $\psi$ , investment in  $\beta$  also induces a direct utility effect. Increasing  $\beta$ , the effectiveness of terrorism, directly raises  $x$ . Therefore, it can be optimal for the leader to increase his spending on  $\beta$  even if this decreases  $s_i$  (i.e.  $\frac{\partial MRS_i}{\partial \beta} < 0$ ) as long as

$$\frac{\partial x_i}{\partial \beta} = \beta \frac{ds_i}{d\beta} + s_i > 0.$$

### 5.3 Simultaneous Equilibria

The optimality conditions of the leader, (14), and the terrorist, (8), together with the income constraints (7) and (13), determine the equilibrium of the considered leader-follower model. This equilibrium can be of either of two types: interior or corner solutions.

An interior equilibrium arises if all optimality conditions hold simultaneously, such that both agents consume privately, the level of terrorist activities is positive and the leader invests in

all three policy variables  $\alpha$ ,  $\beta$  and  $\psi$ . An exemplary equilibrium reaction of a terrorist to an increase in one of the policy instruments, in this case  $\psi$ , is depicted in Figure 4 where  $p_s$  denotes the budget line and  $\bar{U}_i(\psi_k, \alpha, \beta)$ ,  $k = 1, 2$ , are the equilibrium indifference curves for  $\psi_k$ .<sup>11</sup> Following an increase in  $\psi$ , the marginal rate of substitution increases and induces a reallocation of funds towards terrorist activities  $s_i$ , i.e. from  $s_{i\psi_1}$  to  $s_{i\psi_2}$ .<sup>12</sup>

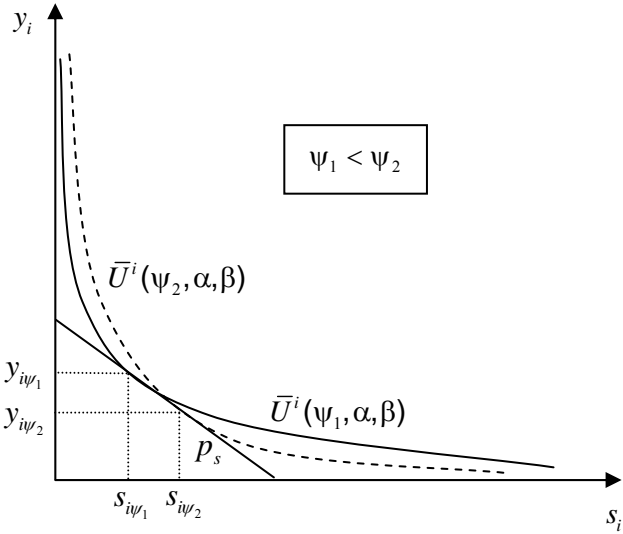


Figure 4: Optimal Allocation and Variation of  $\psi$ .

Corner solutions arise if it is optimal for the leader or the terrorist to set one or more variables to either zero or to their upper limit (e.g.  $\psi = 1$ ). Of all potential corner solutions, it is especially one type that is of interest in the context of terrorism - situations in which the terrorist gives himself completely to the terrorist organization. As the terrorist foregoes any private consumption in this case, it can be interpreted as the decision to commit a suicide attack.<sup>13</sup> The scope for this type of corner solutions to arise will be considered in more detail in the following section.

<sup>11</sup> The comparative statics of  $\alpha$  and  $\beta$  can be visualized along the same lines.

<sup>12</sup> In Figure 4 it is assumed that  $y_i$  and  $s_i$  are bad substitutes, i.e. that their elasticity of substitution falls short of unity (see also Section 6).

<sup>13</sup> Azam (2005) provides another interesting analysis of the phenomenon of suicide bombing by employing the dynastic family hypothesis. He explicitly links the terrorist to his descendants by some altruism parameter.

## 6. Suicide Attacks

Our interest in this specific form of corner solution, i.e. in this specific type of terrorism, is well justified by empirical data: Although suicide attacks made up only 3% of all terrorist incidents in the period from 1980 to 2001, they were responsible for 48% of all related deaths (see Pape 2003). This death toll shows very clearly that suicide attacks have to be considered in any analysis dealing with terrorism.

The phenomenon of people being willing to sacrifice their life for some ‘higher goal’ is nothing new in history. Only think of the Japanese ‘kamikaze’ pilots in World War II. Then, as well as today, people willing to commit suicide were and are used systematically as weapons. Yet, the puzzling question is why people are willing to go to that extreme. Often stigmatized as irrational, it can be shown that this kind of behavior can be compatible with the action of a rational agent. Whether or not a terrorist supporter might become a potential suicide attacker depends crucially on his preference structure and the actions of those who might be able to direct him.

In our model it is the leader who can influence the choices of a terrorist by setting  $\alpha$ ,  $\beta$  and  $\psi$ . Whether a terrorist can, however, be induced to become a suicide bomber depends crucially on his utility function with the elasticity of substitution between private goods and the terrorism related variables,  $x$  and  $z$ , being of specific importance. To get some intuition with respect to when interior and when corner solutions might be feasible consider the following.

The leader's perceived utility is supposed to be given by

$$U_{Lp} = x^\gamma, \quad 0 < \gamma < 1 . \quad (14)$$

To show the importance of the terrorist's autonomous preferences for the scope of suicide attacks to arise, consider the following types of utility functions: A linear utility function

$$U_i = \epsilon_1 z_i + \epsilon_2 x + \epsilon_3 y_i, \quad \epsilon_1, \epsilon_2, \epsilon_3 > 0 \quad (15)$$

versus a CES-type utility function

$$U_i = \left[ \delta_1 z_i^\sigma + \delta_2 x^{\frac{\sigma-1}{\sigma}} + (1 - \delta_1 - \delta_2) y_i^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}, \quad \delta_1, \delta_2, 1 - \delta_1 - \delta_2 > 0, \\ \sigma > 0, \sigma \neq 1 \quad (16)$$

where  $\sigma$  denotes the elasticity of substitution between the different utility yielding variables.

One scenario exists under which a suicide attack might be optimal for agent and leader independently of the type of autonomous utility function: Assume that the costs of influencing  $\psi$ , the degree to which the agent internalizes the leader's utility, are low. If for  $\psi = 1$  the marginal rates of substitution of  $\psi$  with respect to  $\alpha$ ,  $\beta$  and  $y_L$  are still larger than the associated price ratio, the leader will find it optimal to set  $\psi$  equal to unity, such that the terrorist solely cares about the leader's utility level. In this case, the terrorist will spend all his income on  $s_i$  as private consumption yields no utility to him. When  $\psi = 1$ , the leader will always set  $\alpha > 0$  in order to assure that the terrorist receives some positive utility from  $s_i$  and thereby prevent him from being indifferent between  $s_i$  and  $y_i$ .

With respect to  $\beta$ , it is obviously in the leader's best interest to always assure for  $\beta > 0$  - assuming that terrorist activities are an essential good to the leader. The latter assumption seems sensible for our analysis, as it focuses on the decisions of the terrorist regarding the level of terrorist activity rather than on how to dissuade the leader from promoting terrorism.

If the price of  $\psi$  is not sufficiently low to render  $\psi = 1$  optimal, the scope of suicide attacks to arise, depends crucially on the autonomous utility function of the agent. Let us consider the two above examples, (15) and (16) successively.

### **Linear utility**

If the autonomous utility of the terrorist is linear, private consumption and terrorist activities are perfect substitutes. This implies that by setting policy variables accordingly, the leader can always induce the terrorist to become a suicide bomber. One available option would, e.g., be to increase  $\alpha$  until the marginal rate of substitution between  $y_i$  and  $s_i$  (MRS) exceeds  $p_s$  for  $y_i = 0$ . As the MRS is finite for  $y_i \rightarrow 0$ , this option is technically feasible. Its optimality, however, depends on relative prices as well as the preferences and income of the leader. The line of reasoning is equivalent to the case  $\psi = 1$ . Instead of  $\alpha$ , the leader could equally employ  $\psi$  or  $\beta$  to induce a suicide attack.

### **CES-utility**

When assuming a CES-type utility function, the implications regarding corner solutions and policy implications depend crucially on the elasticity of substitution between the utility yielding variables. If  $\sigma > 1$ , neither private consumption nor terrorist activities are essential

for the terrorist's utility to be positive and he can substitute out of  $y_i$  as well as  $s_i$  without his autonomous utility going to zero. If  $\sigma < 1$ , however, both variables are essential for utility to be positive. In this case,  $y_i$  (resp.  $s_i$ ) going to zero cannot be compensated by an increase in  $s_i$  (resp.  $y_i$ ). Let us take a look at the cases  $\sigma > 1$  and  $\sigma < 1$  in turn:

$\sigma > 1$ : Although substitutability between  $y_i$  and  $s_i$  is high in this case, it still holds that an agent values private consumption, the higher, the less he consumes, i.e.  $\lim_{y_i \rightarrow 0} U_{iy_i} = \infty$ .<sup>14</sup> Due to this property, the compensation an agent expects for giving up private consumption goes to infinity, i.e. the marginal rate of substitution goes to zero. Consequently, an agent would never be willing sacrifice himself as long as there are any costs attached to terrorist activities. Even setting  $\alpha = 0$ , which might be optimal if the costs of  $\alpha$  are prohibitively high, cannot induce a suicide attack.<sup>15</sup>

$\sigma < 1$ : If private consumption and terrorist activities are poor substitutes,  $y_i$  will always be driven to zero in the equilibrium. For  $\sigma < 1$  the marginal rate of substitution between  $y_i$  and  $s_i$  in (8) falls with rising levels of  $\alpha$ . As already shown in the previous section, it cannot be optimal for the leader to invest in  $\alpha$  if this induces the terrorist to engage less in terrorist activities. Yet the lower the level of  $\alpha$ , the higher the marginal rate of substitution between  $y_i$  and  $s_i$ . If  $\alpha$  becomes sufficiently low, the MRS goes to infinity and the terrorist substitutes out of private consumption

The reasoning behind this result is that for  $\sigma < 1$  all utility yielding variables are essential for the terrorist, i.e. if the level of one utility yielding variable goes to zero, utility also goes to zero. When the leader drives  $\alpha$  to zero, he makes it more difficult for the agent to obtain a positive level of  $z_i$ . So the agent counteracts this policy by raising  $s_i$  to the limit. With respect to the leader's investment in  $\psi$ , it can never optimal for the leader to invest in  $\psi$  if  $\sigma < 1$ . As the terrorist already invests his entire income in  $s_i$ , positive levels of  $\psi$  could not enhance  $s_i$  any further.

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<sup>14</sup> Due to our interest in suicide attacks we concentrate on  $y_i \rightarrow 0$ , yet the same reasoning holds for  $s_i \rightarrow 0$ .

<sup>15</sup> For analytical details see Pittel and Rübhelke (2006).

## 7. Counter-terrorism Policies and Concluding Remarks

From the characteristics approach different starting points to counter terrorism can be deduced. There are the two stages relating terrorist action and terrorists and on both of these stages different policies can be applied. Furthermore, the counter-measures might be employed on the leader as well as on the follower level. Subsequently, in an illustrative fashion, we will outline some anti-terrorism measures which can be recommended following our approach.

Since terrorist leaders regularly pursue personal objectives (e.g. personal wealth) which differ from the terrorist organisation's objectives, bribing leaders might be an attractive option to weaken the organisation. Furthermore, the impairment of the leaders' influence on followers represents another reasonable way to combat terrorism.

One way of impairing this influence is to strive for derogating the pursuit of *reasons* for terrorism, which in turn will negatively affect the utility level of both the terrorist leaders and the followers. According to Frey and Lüchinger (2004) terrorists seek to attain three main tactical goals in order to achieve their ultimate goals. These tactical goals are: attention of the media, destabilization of the polity, damaging of the economy. Making it harder to attain these tactical goals will compromise the pursuit of the *reasons* for terrorist action (or the terrorist organisation's ultimate goals). Frey and Lüchinger (2004) suggest strengthening decentralized decision-making in the polity and economy as an adequate means to hinder the attainment of the ultimate terrorist goals.

Counter-measures may also consist in offering alternative and non-terrorist ways for attaining the *causes* for terrorist activity.<sup>16</sup> As the characteristics approach outlined in this book chapter implies, if private characteristics like the rise in self-esteem and appreciation can be gained from other sources than terrorism, terrorist dedication becomes a less attractive option for terrorists to pursue the *causes* for terrorism.

Anti-terrorist policies may also seek to prevent the manipulation of beliefs held by potential terrorists. Such manipulation of beliefs may be conducted by terrorist leaders by means of adding consonant cognition. The terrorist organisation might accomplish this by e.g. providing social services in order to attain a kind of legitimacy. As Hilsenrath (2005) explains,

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<sup>16</sup> The importance of improving terrorists' outside options as a measure to counter terrorism has recently also been stressed by Berman and Laitin (2008: 1963-1964).



the Hamas is a significant provider of health services to the Palestinian community. “Those who provide dependable health services generate good will” (Hilsenrath 2005: 366). The good will among the community will cause a suppression of critique and hence supports the mitigation of cognitive dissonance among Hamas supporters. Consequently, the support of more moderate groups in providing such social services seems to be a reasonable strategy in order to diminish the tribute paid to extremist groups for providing social services. This in turn will impair dissonance-reductions by terrorist supporters.

In order to fight the terrorist leaders’ manipulation of (the importance of) cognitions by means providing selective information via the mass media and in order to mitigate the publicity of terrorist action, it is important to derogate the symbiotic relationship between terrorism and the media. As Rohner and Frey (2007: 142) point out: “There is a common-interest-game, whereby both the media and terrorists benefit from terrorist incidents and where both parties adjust their actions according to the actions of the other player.” Among the policy recommendations Rohner and Frey (2007: 142) make are the avoidance of attributing terrorist attacks to particular groups and the subsidization of high quality journalism.

Furthermore, according to Haddad and Khashan (2002: 825): “The mass media and other agents of socialization in Arab and Muslim lands never cease telling their publics that the Western-led United States is largely responsible for their debacle.” They note that Arabs and Muslims need to reform their media in order to overcome such misleading ways of informing the public. Faria and Arce M. (2005: 268) see an effective way to disseminate credible information “by increasing access to, and the number of, mass-media news providers.” By means of such information-improving activities dissonant cognitions can be produced among terrorist supporters.

Although the focus in this book chapter was mainly on (the mitigation of marginal) benefits of terrorism, measures raising marginal cost of terrorist acts are reasonable complements to measures mitigating marginal benefits of terrorist actions (Rübbelke 2005: 22). Moreover, several counter-terrorist policies tend to affect both, marginal cost and benefits of terrorism. The reinforcement of control measures at airports, for example, reduces the likelihood of successful terrorist attack and hence the expected attack-associated benefits, but may also raise the cost of attacking due to the more difficult selection of appropriate targets.

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## Appendix

Partial derivation of (8) with respect to  $\psi$ ,  $\alpha$  and  $\beta$  yields:

$$\left. \frac{\partial MRS_i}{\partial \psi} \right|_{s_i, y_i} = \alpha c_i \frac{x_i U_{L_P} x [z_i U_i + (y_i + x_i) c_i U_{iy_i}] + (y_i + x_i) U_{L_P} [y_i U_{iy_i} + x_i (U_{ix} + \alpha U_{iz_i})]}{((1-\psi)(y_i+x_i)c_i U_{iy_i}) + z_i [(1-\psi)U_i - \psi U_{L_P}]^2}$$

$$\left. \frac{\partial MRS_i}{\partial \alpha} \right|_{s_i, y_i} = \frac{1}{[(1-\psi)(y_i+x_i)c_i U_{iy_i}] + z_i [(1-\psi)U_i - \psi U_{L_P}]} \left( [x_i MRS_i ([\psi U_{L_P} - (1-\psi)U_i] - (1-\psi)[(y_i+x_i)U_{iy_i} + z_i U_{iz_i} + c_i(y_i+x_i)U_{iy_i z_i})] + [y_i [\psi U_{L_P} - (1-\psi)U_i] + (1-\psi)U_{iz_i} (c_i(y_i+x_i) + x_i z_i) + x_i (\psi(c_i + z_i)U_{L_P x} + (1-\psi)(y_i+x_i)U_{ix}) + c_i(1-\psi)(y_i+x_i)x_i (U_{ix z_i} + \alpha U_{iz_i z_i})] \right)$$

$$\left. \frac{\partial MRS_i}{\partial \beta} \right|_{s_i, y_i} = \frac{MRS_i}{\beta} + \frac{\beta s_i}{z_i ((1-\psi)U_i - \psi U_{L_P}) + (y_i+x_i)c_i(1-\psi)U_{iy_i}} \left( MRS_i \left( \alpha ((1-\psi)U_i - \psi U_{L_P}) + ((1+\alpha)(y_i+x_i) + c_i)(1-\psi)U_{iy_i} + z_i ((1-\psi)(U_{ix} + \alpha U_{iz_i}) - \psi U_{L_P x}) + (y_i+x_i)(1-\psi)(U_{iy_{ix}} + \alpha U_{iy_i z_i}) \right) + c_i \left( \psi(2\alpha U_{L_P x} + z_i U_{L_P x x}) + (1-\psi)(2U_{ix} + \alpha U_{iz_i}) + (y_i+x_i)(U_{ixx} + \alpha(2U_{ix z_i} + \alpha U_{iz_i z_i})) \right) \right)$$

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