

Terrorism: deterrence may backfire

Working Paper**Author(s):**

Frey, Bruno S.; Lüchinger, Simon

Publication date:

2002

Permanent link:

<https://doi.org/10.3929/ethz-a-004457697>

Rights / license:

In Copyright - Non-Commercial Use Permitted

Originally published in:

Working paper / Institute for Empirical Research in Economics 136



Institute for Empirical Research in Economics
University of Zurich

Working Paper Series
ISSN 1424-0459

Working Paper No. 136

Terrorism: Deterrence May Backfire

Bruno S. Frey and Simon Luechinger

December 2002

TERRORISM: DETERRENCE MAY BACKFIRE

by

Bruno S. Frey and Simon Luechinger[□]

(University of Zurich)

(this version 2 August 2002)

Present anti-terrorist policy concentrates almost exclusively on deterrence. It seeks to fend off terrorism by raising the cost of undertaking terrorist acts. This paper argues that deterrence policy is less effective than generally thought and induces in some cases even *more terrorism*. This is, in particular, the case if deterrence policy induces a *centralisation* of decision-making in the polity and economy. Therefore, an effective anti-terrorist policy should focus more on reducing the expected benefits of terrorist acts to prospective terrorists. Such a policy is based on *strengthening* rather than weakening decentralised decision-making.

JEL Classification: D 74, F00, H56, K42

Keywords: Terrorism, Deterrence, Decentralization, Democracy, Federalism, Market Economy, Rational Choice, Motivation

[□] Bruno S. Frey is Professor of Economics at the Institute for Empirical Economic Research, University of Zuerich, Bluemlisalpstrasse 10, CH-8006 Zuerich, Switzerland. Tel: +41 1 6343730. Fax: +41 1 6344907. E-mail: bsfrey@iew.unizh.ch. Simon Luechinger is research assistant at the above Institute. We are grateful for helpful remarks to [will be inserted after acceptance for publication]

1. Introduction

The events of 11 September have sparked renewed interest in terrorism. There is already a large literature on terrorism.¹ Only a small part of this literature uses a *rational choice* approach and, even then, usually concentrates on specific aspects.² The rational choice analysis provided here intends to demonstrate that this approach offers valuable new insights compared to the many other contributions rooted in sociology, law, political science or international relations. Our analysis also differs from many other studies on terrorism in that it emphasises generally neglected consequences for anti-terrorist policy. We wish to argue that the present policy (especially that pursued by the United States in the wake of the attacks on 11th September 2001) focuses almost exclusively on deterrence. It seeks to fend off terrorism by raising the cost of undertaking terrorist acts. While such deterrence raises the (marginal) cost to terrorists and therefore tends to reduce the number and intensity of terrorist attacks, it is less effective than generally thought. There may even be cases in which a deterrence policy induces *more terrorism*. This is, in particular, the case if deterrence policy induces *centralisation* of decision-making in the polity and economy.

¹ Among the most recent contributions see e.g. Kushner (1998), Stern (1999), and Wilkinson (2000). For an overview on other recent publications see Henderson (2001).

² The application of economic methods – in particular the application of the economics of crime (see Becker 1968 and others) – to the study of terrorism began with Landes (1978). Following Landes, who studied skyjackings in the United States, several contributions concentrate on hostage-taking events (Sandler, Tschirhart, and Cauley 1983, Atkinson, Sandler, and Tschirhart 1987, Sandler and Scott 1987, Lapan and Sandler 1988, Selten 1988, Islam and Shain 1989, Scott 1991, Shahin and Islam 1992, and Sandler and Enders 2002). Im, Cauley, and Sandler (1987), Enders, Parise, and Sandler (1992), Enders and Sandler (1995, 2000, and 2002), and Sandler and Enders (2002) study the temporal pattern of terrorist incidents and find that for most types of events cycles are prevalent. These authors also find evidence of both substitutes and complements among different attack modes (Im, Cauley, and Sandler 1987, Cauley and Im 1988, Enders, Sandler and Cauley 1990a and 1990b, and Enders and Sandler (1987, 1993, 1995, and 2002). Several contributions investigate the economic impact of terrorist attacks (e.g. Enders and Sandler 1991, Enders, Sandler, and Parise 1992, Enders and Sandler 1996, Pizam and Smith 2000, Drakos and Kutun 2001, Abadie and Gardeazabal 2001, Navarro and Spencer 2001 and Glaeser and Shapiro 2001). Intergovernmental strategic interactions in counterterrorist activities are analyzed using game theory in Sandler and Lapan (1988), Lee (1988), and Lee and Sandler (1989). Lapan and Sandler (1993) and Overgaard (1994) employ game theory to model signalling games. Early choice-theoretic models can be found in Landes (1978), Sandler, Tschirhart and Cauley (1983), Kirk (1983), and Lichbach (1987). Alternative government responses to terrorism are proposed in Frey (1988 and 1999) and Bierstecker (2002).

We suggest that an effective anti-terrorist policy should focus more on reducing the expected benefits of terrorist acts *to the prospective terrorists*. Such a policy is based on *strengthening* rather than weakening decentralised decision-making: the institutions of polyarchy, i.e. a decentralisation of political power via democracy and federalism, as well as the market system, i.e. a decentralisation of economic actors, are an effective antidote against terrorist attacks. Under these conditions, terrorism has little or no effect on the stability of the polity and the economy. The expected benefits from terrorism drop. This discourages political enemies from engaging in terrorist violence and encourages them to seek more peaceful forms of pursuing their goals.

Section 1 presents a simple rational choice model of terrorism based on the notion of equilibrium in a cost-benefit calculus framework. The following section focuses on the marginal cost of undertaking terrorist acts. Section 3 looks at the benefits of terrorist acts from the point of view of prospective terrorists. The next section discusses anti-terrorist policy. Section 5 notes that deterrence policy may be counterproductive and concludes that decentralisation of the polity and the economy is the most effective and desirable antidote against terrorism.

2. A Simple Rational Choice Model of Terrorism

Figure 1 depicts the marginal costs and marginal benefits of terrorism to the prospective terrorists as a function of the extent and intensity of terrorism T .

Figure 1 about here

The variable T is open to measurement as shown by the considerable number of indicators existing of terrorist acts. Examples are the number of incidents in general or special types of

attack. Another frequently used indicator for the extent and intensity of terrorism is the number of victims, especially the number of deaths (see e.g. Abadie and Gardeazabal 2001).

The *marginal cost* curve MC reflects the *costs* of engaging in an additional terrorist act. It slopes upwards because it is increasingly costly to undertake terrorist acts³. To begin with, the easiest and most conveniently available targets are chosen. Thereafter it becomes increasingly difficult to undertake terrorist acts. The costs involved for the terrorists consist in material resources, collecting information, as well as the time needed to prepare the attacks. Finally, costs also reflect the danger involved in actually undertaking the act. A terrorist may be hurt or lose his or her life while preparing or undertaking the act, may be captured, interrogated, possibly tortured, imprisoned or even put to death. For the sake of simplicity, the marginal cost curve is drawn as a straight line, but it may well be, of course, that the marginal cost curve becomes increasingly steep. But the basic gist of the following analysis is thereby unaffected.

The marginal cost curve for terrorist acts is governed by terrorists' behaviour. This will be more fully discussed in sections 2.

The *marginal benefit* curve MB reflects the benefits to terrorists of undertaking additional terrorist acts. The curve is assumed to slope downward according to the number and intensity of terrorist acts. This is the case if additional terrorist acts have less and less effect on the targeted

³ In the unlikely cases of a downward sloping marginal cost curve or a upward sloping marginal benefit curve the propositions presented in this paper do not hold if the absolute value of the slope of the marginal cost curve is greater than the absolute value of the slope of the marginal benefit curve (i.e. if $\frac{\partial MC}{\partial T} < \frac{\partial MB}{\partial T} < 0$ or $0 < \frac{\partial MB}{\partial T} < \frac{\partial MC}{\partial T}$). Over a certain range, the marginal benefit curve may be upward sloping or the marginal cost curve may be downward sloping. The latter is the case if there are economies of scale in planning and executing a certain number of operations (see e.g. Enders and Sandler 1999, p. 156). But over the whole range of operations, and in the long-run, this is unlikely to be the case.

country and population. But this need not necessarily be the case; one could imagine situations in which the society targeted becomes more and more affected by terrorism so that stepping up terrorism increases its marginal benefit. But, as will be argued below, this is unlikely to happen, because the persons and societies targeted learn to react to terrorist acts in such a way that their *marginal* effects tend to diminish over time. The position and slope of the marginal benefit curve for terrorism thus depends on the behaviour of the persons targeted. This will be more fully discussed in section 3.

The intersection of the marginal cost and marginal benefit curves identifies the *equilibrium* extent and intensity of terrorism T^* . Rational choice theory suggests that this corresponds to the number of terrorist acts observed in reality, measured by the indices of terrorism. The following sections look more closely at what determines this equilibrium and therewith the empirically observed extent of terrorism. They raise the question of how much terrorism is to be expected when the marginal cost and marginal benefit curves shift.

3. Raising the Cost of Terrorism

The marginal cost curve depends on the behaviour of terrorists. Two extreme assumptions may be made:

- (1) The persons engaging in terrorism are solely *extrinsically* motivated. They undertake their attacks because of the compensation they receive. In most cases, compensation takes the form of gaining recognition and admiration from the persons supporting their cause. Many terrorists also enjoy the fame achieved in the international and local press. In some cases, terrorists even receive monetary compensation for their acts, or their families are guaranteed

financial support.⁴ Other compensations may be attractive political positions in the future and corresponding rents in the case terrorists are able to win over the existing government. While the analysis does not depend on whether the terrorists receive any inducement in the form of money, a careful reading of the evidence suggests that it often plays at least some role. An exogenous increase in (any type of) extrinsic incentive produces a rightward shift of the supply curve resulting in a larger equilibrium amount of terrorism.

(2) The prospective terrorists are solely *intrinsically* motivated.⁵ They are convinced of doing the right thing, irrespective of any reward from outside. It may certainly be the case that *some* persons are motivated solely from within, in which case the marginal cost curve would be steeper: such persons react less to either cost or rewards of their actions.

The available evidence⁶ suggests that most prospective terrorists are strongly influenced by their social environment, and react to external offered incentives. Both extrinsic and intrinsic motives play a role. It follows that the marginal cost curve is positively sloped and shifts upwards (downwards) with an exogenous increase in the cost (rewards) of undertaking terrorist acts.

Deterrence policy is based on this behavioural assumption. It aims at raising the cost of terrorist acts by making them more difficult to undertake and by punishing the actors more severely. As shown in figure 2, the marginal cost curve is shifted upwards, resulting in a smaller equilibrium amount of terrorism.

⁴ According to a report in the *The New York Times* (Keller 2002, p. A15), Saddam Hussein raised the payment to the families of suicide terrorists from \$ 10'000 to \$ 25'000.

⁵ For a precise definition and further discussion of intrinsic and extrinsic motivation see e.g. Deci 1975 or Frey 1997.

⁶ Sandler and Scott (1987 p. 37), for example, conclude on the basis of their empirical findings that terrorists “respond appropriately to changes in their constraints”.

Figure 2 about here

In the (unlikely) event that terrorists are *solely* intrinsically motivated, they would not respond to negative incentives like higher risk and more severe punishment. A deterrence policy would have less effect because the marginal cost curve is then steeper. Such a policy is also ineffective if it is offset by rewards. This would be the case if a larger punishment is interpreted as an indication to prospective terrorists that their cause is particularly worthy and will be rewarded accordingly in afterlife.⁷

But deterrence policy does not solely depend on the incentives of the potential terrorists. It also seeks to prevent terrorist acts by making them more difficult to undertake. A case in point is tightening up security measures to prevent the hijacking of planes.⁸ It follows that deterrence policy in many cases is able to shift the perceived cost of terrorism upwards and to therewith reduce the intensity and number of terrorist acts. This is the reason why deterrence is at the forefront of anti-terrorist policy. Indeed, it is often taken to be the *only* possibility, both in the literature and in practical policy.

4. Reducing the Benefits of Terrorism

⁷ Investigating rebellious collective action, Muller and Opp (1986) found that respondents in a survey who believe that rebellious behavior is likely to be costly show a greater tendency to participate than those who believe otherwise. The authors speculate that this behavior reflect a “martyr” syndrome, or alternatively, that higher expected costs may be closely intertwined with the perception of a higher desirability of their cause.

⁸ Enders and Sandler (see e.g. 1993) and various coauthors investigate the effectiveness of such anti-terrorism policies. They find that security measures decrease the type of attacks they are designed for. The problem is that the terrorists react in substituting one type of attack by another, often more deadly, one. Therefore, anti-terrorist policies are far less effective and more costly than anticipated. Kash points out another problem (1998, p. 164): „Significant advancements in counterterrorist approaches have been evenly matched by new terrorist techniques.”

The equilibrium amount of terrorism may also be diminished by reducing the marginal benefits of terrorist acts to the actors, thereby shifting the marginal benefit curve downwards. This is shown in figure 3.

Figure 3 about here

The basic idea is to make terrorism a less attractive option to potential terrorists. In order to achieve this result, the benefits of terrorism to terrorists must be identified. Terrorism is often seen as a specific form of political participation: “Terrorists attempt to assert their interests in the complicated process of deciding ‘who gets what, when, how’, the process of politics” (Badey 1998, p. 96). The ultimate aims of terrorism are – among others – the redistribution of power and property rights and the extortion of rents. For this they seek to attain three main tactical goals, all aimed at imposing the maximum possible cost on the country under attack⁹:

(1) Terrorists seek the *attention of the media* in order to make their cause more widely known.

Laqueur (1977: 106) goes so far to claim that “terrorist action is nothing, publicity is everything”. Terrorists have shown themselves to be very skilful in that respect. They find it a waste of time, effort and resources to undertake terrorist acts which the press and other media do not report. Thus they prefer to undertake terrorist acts in cities, and especially in capitals, where they can be assured of maximum media attention. When terrorists find ways to magnify their acts through the media, terrorism becomes more attractive. The marginal benefit curve shifts upwards and the equilibrium amount of terrorism increases.

⁹ See e.g. Enders and Sandler (1995). Schelling (1991 pp. 20 and 31), for example, asserts as possible goals of terrorists social and political disruptions, economic losses and media attention (as an end in itself). Further, he thinks that terrorism serves to build morale among the supporters of the movement represented by the terrorists (p. 23). This widely acknowledged purpose of terrorism is not further discussed here.

- (2) Terrorists seek to *destabilise the polity*. When the government loses power and, more importantly, when the political system's legitimacy is eroded, the terrorists' chances of achieving their goal improve. Respective actions result in an upward shift in the terrorists' marginal benefit curve. Terrorism becomes a more attractive option, leading to a higher equilibrium level of terrorism.
- (3) Terrorists seek to *damage the economy*. They want to impose material cost on the population in order to make them yield to their demands. Empirical research has shown that terrorist acts significantly reduce the number of tourists (see Enders and Sandler 1991 for the case of Spain; Enders, Sandler and Parise 1992 and Drakos and Kutan 2001 for Mediterranean countries) as well as foreign direct investment (see Enders and Sandler 1996), gross domestic income and stock prices (see Abadie 2002 for the case of the Basque country) and trade (Nitsch and Schumacher 2002; Walkenhorst and Dihel 2002). The consequences of the attacks of September 11th, 2001 on the United States have been estimated to be in excess of \$ 100 billion in direct cost, and as much as \$ 2 trillion in total cost (Navarro and Spencer 2001, Rathbone and Rowley 2002). The more an economy is affected by terrorist acts, the more the terrorists' marginal benefit curve shifts upwards, and the equilibrium amount of terrorism increases.

The three goals are intertwined. The extent of attention attributed to terrorist acts by the media affects both the polity and economy. In all societies the politicians in power react to the media (and therefore want to control them)¹⁰. The effect on the economy of the media works through consumers' and investors' expectations about the future state of business. The importance of

terrorist acts is strongly shaped by how they are reported in the media. The more prominence they get, the more strongly they depress expectations about the future state of the economy.

Economic conditions systematically affect the government, as has been empirically shown in the literature on popularity and election functions. A rise in unemployment and inflation, and a fall in the rate of growth in income lower the survival prospects of the government.¹¹ But bad economic conditions, a deep recession or depression, may even destroy the very constitutional foundations and may lead authoritarian or dictatorial governments taking over.

The polity influences the economy through policy changes. Thus, for example, public expenditures for military purposes may be stepped up, or the flow of finance may be interfered with.¹² More fundamentally, policy changes may affect the basic rules within which the economic actors make their decisions. This is, for example, the case when regulations undermine the workings of an economy based on free markets.

In order to achieve these goals, the terrorists undertake various types of acts (see e.g. Hoffmann 1998 and Wilkinson 2000). One possibility are targeted attacks, for example assassination of a powerful political leader. Another possibility are attacks against targets with a high symbolic value. A third possibility is to disperse fear and panic among the population by attacking civilians (seemingly) at random. The anti-terrorism policy developed in the next section concentrates on the first two type of terrorist acts.

¹⁰ Nacos (1994, pp. 150 – 151) shows that by attacking US interests terrorists have considerable success in influence decision makers who react to the mass media coverage.

¹¹ See, for instance, the survey by Paldam 1981 or Mueller 1989.

5. Anti-terrorist Policy

Within the framework of the simple model of the marginal costs and marginal benefits of terrorist acts, the options of an anti-terrorist policy are identified: the marginal cost to potential terrorists to undertake terrorist acts must be raised and the marginal benefits derived by terrorists must be lowered.

Deterrence policy by raising the (marginal) cost to terrorists has already been alluded to, has been widely applied and therefore needs no further discussion here. It suffices to point out that a deterrence policy also *raises* marginal benefits to terrorists through the cost therewith imposed on the target economy. This effect has been experienced by many countries fighting terrorism (Israel is a good example). Deterrence policy thus shifts both the (marginal) cost *and* the marginal benefit curve upwards. The overall effect on the equilibrium amount of terrorism is theoretically undetermined; it depends on the relative size of the two countervailing effects. In large, productive and not fully employed economies, the costs imposed on the country targeted will be relatively small, so that terrorists' marginal benefit curve shifts upwards only a little. In that case, a deterrence policy will successfully reduce the intensity and extent of terrorist acts.

The second anti-terrorist policy option has been rarely discussed and has little, if any, importance in reality. But one of the most effective ways to immunise a country against terrorist attacks is to *decentralise activity*, both with respect to the polity and the economy.¹³

¹² For an analysis of the financial flows connected to terrorism, see Schneider (2002).

¹³ Other anti-terrorism policies based on reducing the expected benefits of terrorism are discussed in Frey (1988 and 1999) and Lapan and Sandler (1988). Frey suggests that the authorities should refrain from attributing a particular terrorist incident to any particular group. Rather, they should stress that many different actors must be considered as the possible perpetrators. Such an information policy sharply reduces terrorists' benefits in the form of publicity. Lapan and Sandler discuss the often proposed and applied strategy never to negotiate with terrorists in hostage-taking incidents. According to the conventional wisdom, this strategy would discourage the taking of hostages because the terrorists know they cannot expect a benefit from such acts. Lapan and Sandler identify the rather restrictive scenarios in which a no-negotiation strategy is desirable in the case of a credible precommitment.

Decentralising politics

A polity with many different centres of decision-making and implementation is difficult, if not impossible, to destabilise. If one of the centres is hit and destroyed by a terrorist attack, the other centres can take over. That this is indeed possible has been demonstrated by a recent incident in Switzerland. In September 2001, a man ran amok (he was not a terrorist) in the parliamentary building of the Swiss canton Zug and shot dead no less than three of the seven members of the government council (Regierungsrat), as well as eleven members of parliament. He also injured a significant number of other members of the government and parliament. Nevertheless, within a very short period of time (something like half an hour), the government was functional again, not least because the heads of the partly autonomous communes took over.

A similar incidence in Armenia plunged the country into a political crisis. In October 1999, five gunmen burst into Armenia's parliament assassinating the Prime Minister, Parliamentary Speaker and seven other government officials. Armenia's Defence Minister stated that the situation which has been created is fraught with uncertainty, the internal and external security of the state were in danger (Freedom House 2000). Because of the centralised nature of Armenia, the killings left a power vacuum and lesser federal levels were not able to take over.

Decentralising political power, or to use the term used by Dahl and Lindblom (1953), polyarchy, takes two forms:

- (a) Political power is distributed between a number of *different political actors*. The classical division of power between government, legislature and courts is the most important. Moreover, the media must be decentralised so that a terrorist attack is unable to control the flow of information. It is no accident that persons attempting a coup d'état first try to gain

control of the TV station. But if there are several TV stations located in different places, this effort is doomed to failure.

(b) Political power must also be divided up between various levels of government. In federal (i.e. spatially decentralised) countries, there is usually the federal, state / provincial / cantonal, and the communal level. But it is possible to go one step further still by introducing a fourth, regional level, or to grant far-reaching autonomy to all kinds of functional, overlapping and competing jurisdictions (for the idea of FOCJ see Frey and Eichenberger 1999).

Strengthening political decentralisation via the division of power and federalism contributes strongly to a country being less vulnerable to terrorist attacks. The attraction of such actions for terrorists is diminished. The marginal benefit of terrorism falls and the equilibrium amount of terrorism is reduced.

Decentralising the Economy

A market economy is based on an extreme form of decentralisation of decision-making and implementation. Indeed, the advantages of the market as an efficient resources allocation mechanism break down when it is centralised via oligopolies or monopolies (e.g. Hayek 1960, 1978). The terrorist attacks against the World Trade Towers drastically demonstrate that economic activity was quickly resumed, despite the high number of people killed and whole firms being wiped out. This was possible because there was a substantial number of competitors, which could quickly be substituted, rather than just one monopolistic supplier of the respective economic services. The more an economy functions according to market principles, the less vulnerable it is to terrorist attack. The terrorists' marginal benefits' curve shifts downwards as terrorist activities prove to have little or no effect on aggregate economic activity.

Obviously, an anti-terrorist policy concentrating on decentralisation has other attractive features: it strengthens democracy and liberalism.

6. Deterrence May Backfire

Policies of fighting terrorism by using deterrence and by decentralisation may interact. Deterrence policy tends to *increase political and economic centralisation*. In order to curb terrorism by deterrence, the central government tends to reduce democratic rights of citizens¹⁴ and to take power away from lower levels of government. Increasing expenditures benefit the military-industrial complex (to use President Eisenhower's term), which is far more centralised and monopolistic than other parts of the economy. More decision-making and implementation power is then vested in one location, making it vulnerable to terrorist attacks¹⁵. Such a deterrence policy does not only shift up terrorists' cost curve upwards, but at the same time also their benefit curve. The two effects are countervailing and it remains open whether the equilibrium amount of terrorist activity actually falls, as generally expected.¹⁶ It may well be that the increasing centralisation of the economy and polity so much raises the attraction to terrorists to

¹⁴ In the United States, in response to September 11th, 2001, "the administration has resorted to a *de facto* suspension of habeas corpus and to reliance on military tribunals", as well as an "erosion of individual freedoms, private property rights, limited government and the rule of law" (Rathbone and Rowley 2002, p. 17).

¹⁵ This danger has indeed been recognized by the American presidential administration. It therefore has plans to establish something like a shadow government (see e.g. Safire 2002). But this substitute has no democratic legitimacy and stands outside the established constitution. It means that powers of the State governors and other constitutional actors is diminished. This works in favour of terrorists.

¹⁶ There are other unintended or even counterproductive consequences of deterrence discussed in the literature. In the political science literature it is often stressed that government repression against dissidents entails feelings of frustration and anger in larger groups of the population. Deterrence may therefore increase the future mobilization of dissidents (Lichbach 1987). It has often been argued that terrorists aim at provoking such a repressive overreaction (Lake 2002). According to Wilkinson (2000) there is abundant evidence that such responses play into the hands of terrorists and become totally counterproductive. Whenever a deterrence policy is directed against a certain type of attack, the terrorists react by substituting this type of attack by another (as already discussed in footnote 8). Deterrence has also unintended consequences for initially uninvolved countries. A deterrence policy of a potential target has negative externalities for other potential targets because it diverts terrorist attacks to these other targets. Therefore without cooperation among the potential targets, each target expends too much effort on deterrence (Sandler and Lapan 1988).

such an extent that the equilibrium amount of terrorism increases. This situation is shown in Figure 4.

Figure 4 about here

The lowering effect of deterrence is likely to dominate in the short term, but it may well be reversed over the long term. This should be taken into account by a wise anti-terrorist policy. Political economy suggests, however, that a deterrence policy nearly always tends to be favoured by governments, because it demonstrates politicians' determination to fight terrorism. In contrast, seeing and conserving the value of decentralisation has more the character of a public good, whose maintenance is not directly attributed to the government in power. It is therefore all the more important to safeguard political and economic decentralisation at the *constitutional level*.

References

- Abadie, A. and Gardeazabal, J., 2001. The Economic Costs of Conflict: A Case-Control Study for the Basque Country. Faculty Research Working Paper, Harvard University RWP01-048.
- Atkinson, S.E., Sandler, T. and Tschirhart, J.T., 1987. Terrorism in a Bargaining Framework. *Journal of Law and Economics* 30, 1 - 21.
- Badey, T.J., 1998. Defining International Terrorism: A Pragmatic Approach. *Terrorism and Political Violence* 10, 90 - 107.
- Becker, G.S., 1968. Crime and Punishment: An Economic Approach. *Journal of Political Economy* 76, 169-217.
- Bierstecker, T.J., 2002. Targeting Terrorist Finances: The New Challenges of Financial Market Globalization. Watson Institute for International Studies Working Paper.
- Cauley, J. and Eric-Iksson, I., 1988. Intervention Policy Analysis of Skyjackings and Other Terrorist Incidents. *American Economic Review* 78, 27 - 31.
- Dahl, R.A. and Lindblom, C.L., 1953. *Politics, Economics and Welfare*. New York, Harper.
- Deci, E.L., 1975. *Intrinsic Motivation*. New York, Plenum Press.
- Drakos, K. and Kutan, A.M., 2001. Regional Effects of Terrorism on Tourism: Evidence from Three Mediterranean Countries. ZEI (Center for European Integration Studies) B 26.
- Enders, W., Parise, G.F.P. and Sandler, T., 1992. A Time-Series Analysis of Transnational Terrorism: Trends and Cycles. *Defence Economics* 3, 305 - 320.
- Enders, W. and Sandler, T., 1991. Causality Between Transnational Terrorism and Tourism: The Case of Spain. *Terrorism* 14, 49 - 58.
- Enders, W. and Sandler, T., 1993. The Effectiveness of Antiterrorism Policies: A Vector-Autoregression-Intervention Analysis. *American Political Science Review* 87, 829 - 844.
- Enders, W. and Sandler, T., 1995. Terrorism: Theory and Applications, in: Sandler, T. and Hartley, K. (ed.), *Handbook of defense economics*. Volume 1. *Handbooks in Economics*. Volume 12. Amsterdam, New York and Oxford: Elsevier, 213 - 249.
- Enders, W. and Sandler, T., 1996. Terrorism and Foreign Direct Investment in Spain and Greece. *Kyklos* 49, 331 - 352.
- Enders, W. and Sandler, T., 1999. Transnational Terrorism in the Post-Cold War Era. *International Studies Quarterly* 43, 145 - 167.
- Enders, W. and Sandler, T., 2000. Is Transnational Terrorism Becoming More Threatening? A Time-Series Investigation. *Journal of Conflict Resolution* 44, 307 - 332.
- Enders, W. and Sandler, T., 2002. Patterns of Transnational Terrorism, 1970-99: Alternative Time Series Estimates. *International Studies Quarterly* 46, 145 - 165.

- Enders, W., Sandler, T. and Cauley, J., 1990a. Assessing the Impact of Terrorist-Thwarting Policies: An Intervention Time Series Approach. *Defence Economics* 2, 1 - 18.
- Enders, W., Sandler, T. and Cauley, J., 1990b. UN Conventions, Technology and Retaliation in the Fight Against Terrorism: An Econometric Evaluation. *Terrorism and Political Violence* 2, 83 - 105.
- Enders, W., Sandler, T. and Parise, G.F., 1992. An Econometric Analysis of the Impact of Terrorism on Tourism. *Kyklos* 45, 531 - 554.
- Freedom House, 2000. *Freedom in the World. The Annual Survey of Political Rights and Civil Liberties. 1999 - 2000.* New York, Freedom House.
- Frey, B.S., 1988. Fighting Political Terrorism by Refusing Recognition. *Journal of Public Policy* 7, 179 - 188.
- Frey, B.S., 1997. *Not Just for The Money. An Economic Theory of Personal Motivation.* Cheltenham, UK and Brookfield, USA, Edward Elgar.
- Frey, B.S., 1999. Conflict: Fighting Political Terrorism by Refusing Recognition, in: Frey, B.S. (ed.), *Economics as a Science of Human Behaviour.* Boston and Dordrecht, Kluwer.
- Frey, B.S.a.R.E., 1999. *The New Democratic Federalism for Europe: Functional Overlapping and Competing Jurisdictions.* Cheltenham, UK, Edward Elgar.
- Glaeser, E.L. and Shapiro, J.M., 2001. *Cities and Warfare: The Impact of Terrorism on Urban Form.* Harvard Institute of Economic Research Paper 1942.
- Hayek, F.A.v., 1960. *The Constitution of Liberty.* London, Routledge.
- Hayek, F.A.v., 1978. Competition as Discovery Procedure, in: Hayek, F.A. (ed.), *New Studies in Philosophy, Politics, Economics and the History of Ideas.* London, Routledge and Kegan, 119-130.
- Henderson, H., 2001. *Global Terrorism: The Complete Reference Guide.* New York, Checkmark Books.
- Hoffman, B., 1998. *Inside Terrorism.* New York, Columbia University Press.
- Im, I.E., Cauley, J. and Sandler, T., 1987. Cycles and Substitutions in Terrorist Activities: A Spectral Approach. *Kyklos* 40, 238 - 225.
- Islam, M.Q. and Shahin, W.N., 1989. Economic Methodology Applied to Political Hostage-Taking in Light of the Iran-Contra Affair. *Southern Economic Journal* 55, 1019 - 1024.
- Kash, D.A., 1998. An International Legislative Approach to 21st-Century Terrorism, in: Kushner, H.W. (ed.), *The Future of Terrorism: Violence in the New Millennium.* London, SAGE Publications, 163 - 172.
- Keller, B., 2002. Springtime for Saddam. *The New York Times*, April 6th 2002, A15.
- Kirk, R.M., 1983. Political terrorism and the size of government: A positive analysis of violent political activity. *Public Choice* 40, 41 - 52.

- Kushner, H.W., 1998. The New Terrorism, in: Kushner, H.W. (ed.), *The Future of Terrorism: Violence in the New Millennium*. London, SAGE Publications, 3 -20.
- Lake, D.A., 2002. Rational Extremism: Understanding Terrorism in the Twenty-first Century. *Dialog-IQ*, Spring, 15 - 29.
- Landes, W.A., 1978. An Economic Study of US Aircraft Hijackings, 1961-1976. *Journal of Law and Economics* 21, 1 - 31.
- Lapan, H.E. and Sandler, T., 1988. To Bargain or Not To Bargain: That Is The Question. *American Economic Review* 78, 16 - 21.
- Lapan, H.E. and Sandler, T., 1993. Terrorism and Signalling. *European Journal of Political Economy* 9, 383 - 397.
- Laqueur, W. (ed.) 1977. *Terrorismus*. Kronberg, Atheneäum.
- Lee, D.R., 1988. Free Riding and Paid Riding in the Fight Against Terrorism. *American Economic Review* 78, 22 - 26.
- Lee, D.R. and Sandler, T., 1989. On the Optimal Retaliation against Terrorists: The Paid-Rider Option. *Public Choice* 61, 141 - 152.
- Lichbach, M.I., 1987. Deterrence or Escalation? The Puzzle of Aggregate Studies of Repression and Dissent. *Journal of Conflict Resolution* 31, 266 - 297.
- Mueller, D.C., 1989. *Public Choice II*. 2nd ed., Cambridge, Cambridge University Press.
- Muller, E.N. and Opp, K.D., 1986. Rational Choice and Rebellious Collective Action. *American Political Science Review* 80, 471 - 488.
- Navarro, P. and Spencer, A., 2001. September 2001: Assessing the costs of terrorism. *Milken Institute Review* 2, 16 - 31.
- Nitsch, V. and Schumacher, D., 2002. Terrorism and Trade. Paper prepared for the workshop on "The Economic Consequences of Global Terrorism", organized by DIW Berlin, June 14 - 15, 2002.
- Overgaard, P.B., 1994. The Scale of Terrorist Attacks as a Signal of Resources. *Journal of Conflict Resolution* 38, 452 - 478.
- Paldam, M., 1981. A Preliminary Survey of the Theories and Findings on Vote and Popularity Functions. *European Journal of Political Research* 9, 181-199.
- Pizam, A. and Smith, G., 2000. Tourism and Terrorism: A Quantitative Analysis of Major Terrorist Acts and Their Impact on Tourism Destinations. *Tourism Economics* 6, 123 - 138.
- Rathbone, A. and Rowley, C.K., 2002. Terrorism. *Public Choice* 111, 9 - 18.
- Safire, W., 2002. *Me and My Shadow*. New York Times. New York: 31.
- Sandler, T. and Enders, W., 2002. An Economic Perspective on Transnational Terrorism. Working Paper.

- Sandler, T. and Lapan, H.E., 1988. The Calculus of Dissent: An Analysis of Transnational Terrorists' Choice of Targets. *Synthese* 76, 245 - 261.
- Sandler, T. and Scott, J.L., 1987. Terrorist Success in Hostage Taking Incidents: An Empirical Study. *Journal of Conflict Resolution* 31, 35 - 53.
- Sandler, T., Tschirhart, J.T. and Cauley, J., 1983. A Theoretical Analysis of Transnational Terrorism. *American Political Science Review* 77, 36 - 54.
- Schelling, T.C., 1991. What purposes can "international terrorism" serve?, in: Frey, R.G and Morris, C.W. (ed.), *Violence, terrorism, and justice*. Cambridge, Cambridge University Press, 18 - 32.
- Schneider, F., 2002. Money Supply for Terrorism - The hidden financial flows of Islamic terrorist organizations: Some preliminary results from an economic perspective. Paper prepared for the workshop on "The Economic Consequences of Global Terrorism", organized by DIW Berlin, June 14 - 15, 2002.
- Scott, J.L., 1991. Reputation Building in Hostage Taking Incidents. *Defence Economics* 2, 209 - 218.
- Selten, R., 1988. A Simple Game Model of Kidnappings, in: Selten, R. (ed.), *Models of Strategic Rationality*. Boston, Kluwer Academic.
- Shahin, W.N. and Islam, M.Q., 1992. Combating Political Hostage-Taking: An Alternative Approach. *Defence Economics* 3, 321 - 327.
- Stern, J., 1999. *The Ultimate Terrorists*. Cambridge and London, Harvard University Press.
- Walkenhorst, P. and Dihel, N., 2002. Trade Impacts of the Terrorist Attacks of 11 September 2001: A Quantitative Assessment. Paper prepared for the workshop on "The Economic Consequences of Global Terrorism", organized by DIW Berlin, June 14 - 15, 2002.
- Wilkinson, P., 2000. *Terrorism Versus Democracy: The Liberal State Response*. London, Frank Cass.

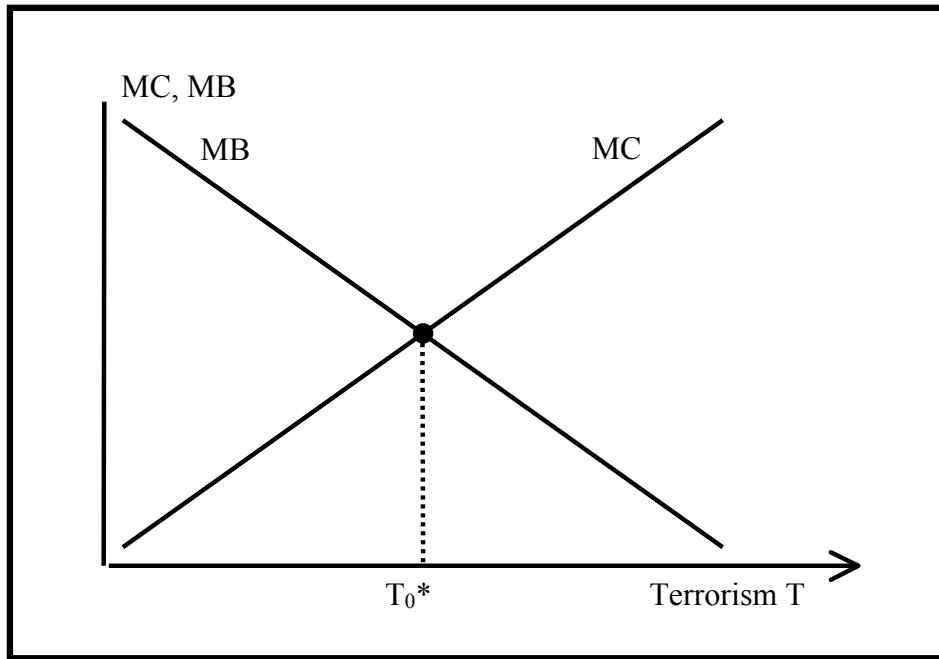


Figure 1: Marginal Cost and Benefit of Terrorism

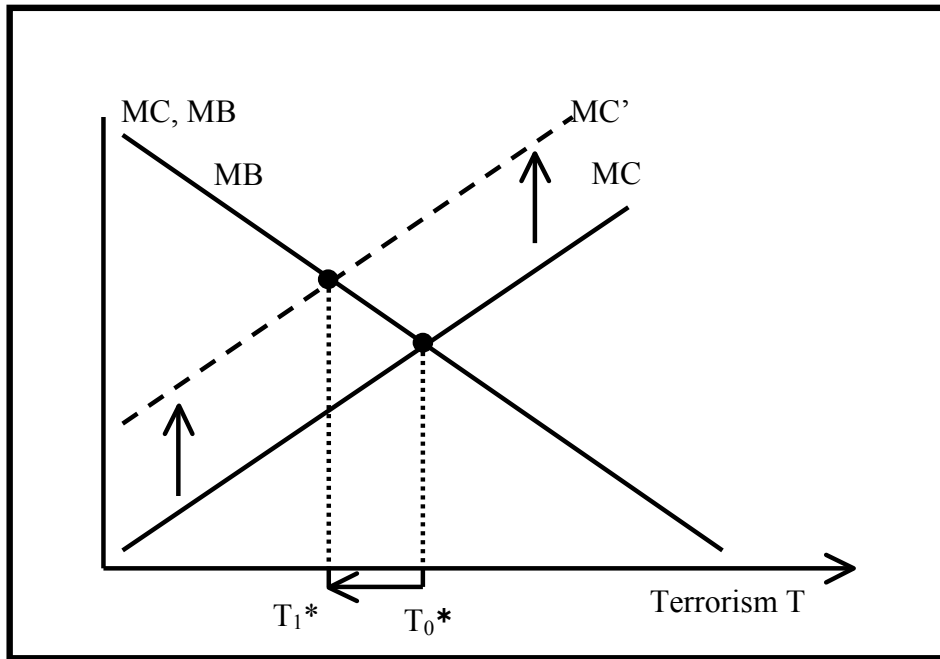


Figure 2: Increasing the Cost of Terrorism

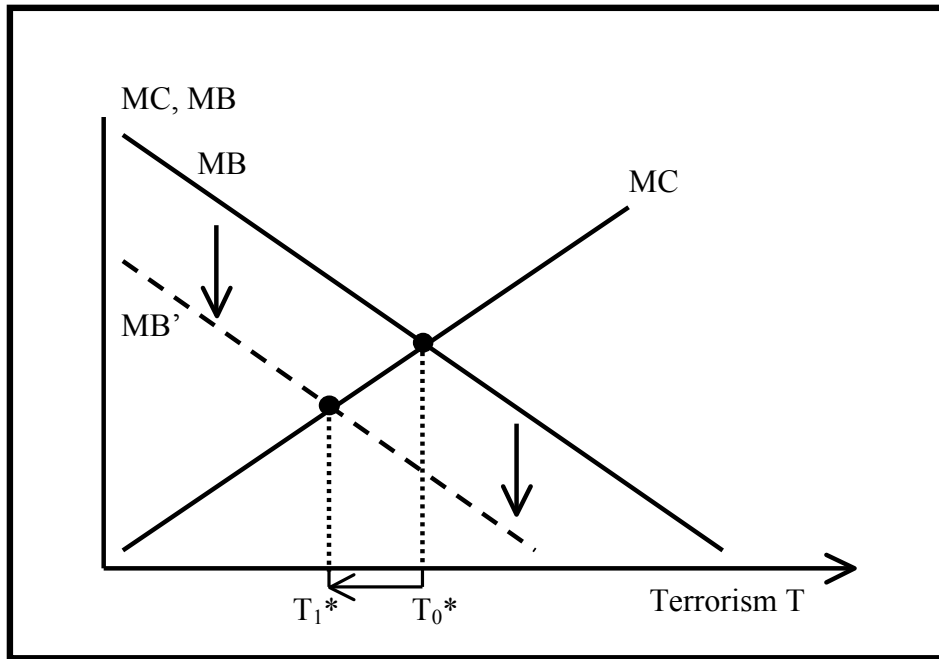


Figure 3: Reducing the Benefits of Terrorism

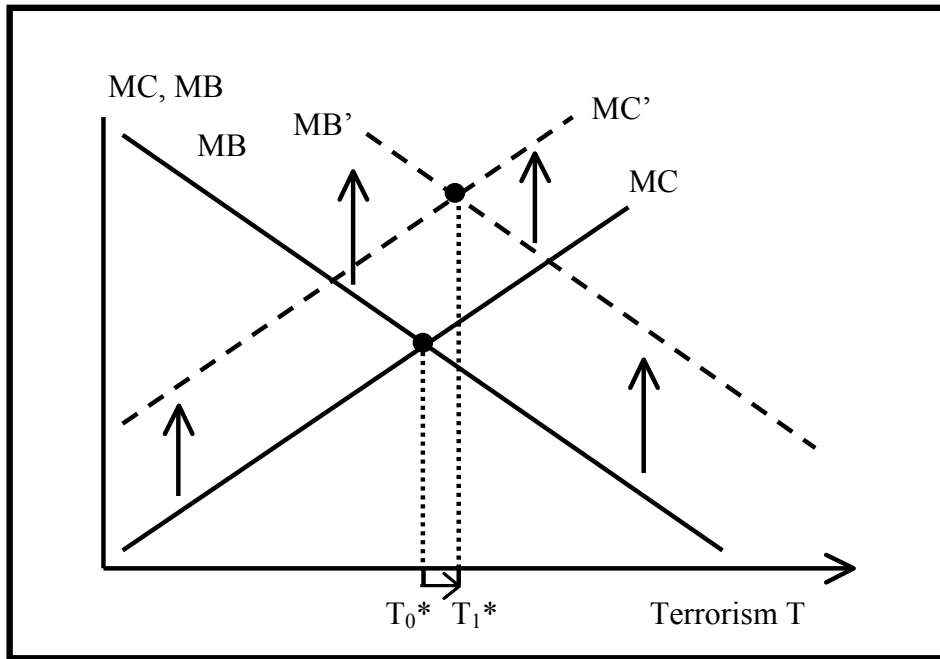


Figure 4: Countervailing Effects of Deterrence

Working Papers of the Institute for Empirical Research in Economics

No.

- 90 Ralf Becker, Urs Fischbacher and Thorsten Hens: *Soft Landing of a Stock Market Bubble. An Experimental Study*, January 2002
- 91 Rabah Amir, Igor V. Evstigneev, Thorsten Hens, Klaus Reiner Schenk-Hoppé: *Market Selection and Survival of Investment Strategies*, October 2001
- 92 Bruno S. Frey and Matthias Benz: *Ökonomie und Psychologie: eine Übersicht*, Oktober 2001
- 93 Reto Schleiniger: *Money Illusion and the Double Dividend in the Short Run*, October 2001
- 94 Bruno S. Frey: *Flexible Citizenship for a Global Society*, November 2001
- 95 Ernst Fehr and Armin Falk: *Psychological Foundations of Incentives*, November 2001
- 96 Takeshi Momi: *Excess Demand Functions with Incomplete Markets – A Global Result*, January 2002
- 97 Colin F. Camerer and Ernst Fehr: *Measuring Social Norms and Preferences using Experimental Games: A Guide for Social Scientists*, January 2002
- 98 Lars P. Feld and Bruno S. Frey: *Trust Breeds Trust: How Taxpayers are Treated*, January 2002
- 99 Aleksander Berentsen and Guillaume Rocheteau: *Money and Information*, January 2002
- 100 Aleksander Berentsen and Guillaume Rocheteau: *Money and the Gains from Trade*, January 2001
- 101 Aleksander Berentsen and Guillaume Rocheteau: *On the Efficiency of Monetary Exchange: How Divisibility of Money Matters*, January 2002
- 102 Daniel Waldenström and Bruno S. Frey: *How Government Bond Prices Reflect Wartime Events. The Case of the Stockholm Market*, January 2002
- 103 Bruno S. Frey and Stephan Meier: *Selfish and Indoctrinated Economists?*, January 2002
- 104 Bruno S. Frey and Stephan Meier: *Two Concerns about Rational Choice: Indoctrination and Imperialism*, January 2002
- 105 Rafael Lalive and Josef Zweimüller: *Benefit Entitlement and the Labor Market: Evidence from a Large-Scale Policy Change*, January 2002
- 106 Ernst Fehr and Urs Fischbacher: *Third Party Punishment*, February 2002
- 107 Bruno S. Frey and Stephan Meier: *Pro-Social Behavior, Reciprocity or Both?*, February 2002
- 108 Thorsten Hens, Klaus Reiner Schenk-Hoppé and Bodo Vogt: *On the Micro-foundations of Money: The Capitol Hill Baby-Sitting Co-op*, March 2002
- 109 Anke Gerber and Marc Oliver Bettzüge: *Evolutionary Choice of Markets*, March 2002
- 110 Rafael Lalive, Jan C. van Ours and Josef Zweimüller: *The Effect of Benefit Sanctions on the Duration of Unemployment*, March 2002
- 111 Reto Föllmi and Josef Zweimüller: *Structural Change and the Kaldor Facts of Economic Growth*, March 2002
- 112 Rafael Lalive and Josef Zweimüller: *Benefit Entitlement and Unemployment Duration: The Role of Policy Endogeneity*, April 2002
- 113 Simon Gächter and Arno Riedl: *Moral Property Rights in Bargaining*, January 2002
- 114 Simon Gächter and Ernst Fehr: *Fairness in the Labour Market – A Survey of Experimental Results*, April 2002
- 115 Reto Föllmi and Urs Meister: *Product-Market Competition in the Water Industry: Voluntarily Nondiscriminatory Pricing*, May 2002
- 116 Bruno S. Frey and Stephan Meier: *Museums between Private and Public - The Case of the Beyeler Museum in Basle*, June 2002
- 117 Bruno S. Frey: *Publishing as Prostitution? Choosing Between One's Own Ideas and Academic Failure*, June 2002
- 118 Bruno S. Frey and Matthias Benz: *From Imperialism to Inspiration: A Survey of Economics and Psychology*, May 2002
- 119 Matthias Benz and Alois Stutzer: *Are Voters Better Informed When They Have a Larger Say in Politics?*, June 2002
- 120 Ernst Fehr, Urs Fischbacher and Elena Tougareva: *Do High Stakes and Competition Undermine Fairness? Evidence from Russia*, July 2002
- 121 Enrico De Giorgi: *Reward-Risk Portfolio Selection and Stochastic Dominance*, August 2002
- 122 Enrico De Giorgi: *A Note on Portfolio Selections under Various Risk Measures*, August 2002
- 123 Klaus Reiner Schenk-Hoppé: *Resuscitating the Cobweb Cycle*, July 2002
- 124 Alois Stutzer: *The Role of Income Aspirations in Individual Happiness*, August 2002

The Working Papers of the Institute for Empirical Research in Economics can be downloaded in PDF-format from <http://www.iew.unizh.ch/wp>

Institute for Empirical Research in Economics, Blümlisalpstr. 10, 8006 Zurich, Switzerland

Phone: 0041 1 634 37 05 Fax: 0041 1 634 49 07 E-mail: bibiewzh@iew.unizh.ch

Working Papers of the Institute for Empirical Research in Economics

No.

- 125 Ernst Fehr and Lorenz Götte: *Do Workers Work More if Wages are High? Evidence from a Randomized Field Experiment*, July 2002
- 126 Anke Gerber, Thorsten Hens and Bodo Vogt: *Rational Investor Sentiment*, August 2002
- 127 Matthias Benz and Alois Stutzer: *Do Workers Enjoy Procedural Utility?*, September 2002
- 128 Thorsten Hens, Klaus Reiner Schenk-Hoppé and Martin Stalder: *An Application of Evolutionary Finance to Firms Listed in the Swiss Market Index*, August 2002
- 129 Bruno S. Frey, Matthias Benz and Alois Stutzer: *Introducing Procedural Utility: Not only What, but also How Matters*, October 2002
- 130 Ernst Fehr and Jean-Robert Tyran: *Limited Rationality and Strategic Interaction, The Impact of the Strategic Environment on Nominal Inertia*, November 2002
- 131 Armin Falk, Rafael Lalive and Josef Zweimüller: *The Success of Job Applications: A New Approach to Program Evaluation*, November 2002
- 132 Dirk Engelmann and Urs Fischbacher: *Indirect Reciprocity and Strategic Reputation, Building in an Experimental Helping Game*, November 2002
- 133 U. Fischbacher, Ch. Fong and E. Fehr: *Competition and Fairness*, December 2002
- 134 E. Fehr and John A. List: *The Hidden Costs and Returns of Incentives – Trust and Trustworthiness among CEOs*, November 2002
- 135 Bruno S. Frey and Matthias Benz: *Being Independent is a Great Thing: Subjective Evaluations of Self-Employment and Hierarchy*, November 2002
- 136 Bruno S. Frey and Simon Luechinger: *Terrorism: Deterrence May Backfire*, December 2002
- 137 Bruno S. Frey and Simon Luechinger: *How To Fight Terrorism: Alternatives To Deterrence*, December 2002

The Working Papers of the Institute for Empirical Research in Economics can be downloaded in PDF-format from
<http://www.iew.unizh.ch/wp/>

Institute for Empirical Research in Economics, Blümlisalpstr. 10, 8006 Zürich, Switzerland

Phone: 0041 1 634 37 05 Fax: 0041 1 634 49 07 E-mail: bibiewzh@iew.unizh.ch