

THE CAUSES AND CONSEQUENCES OF TERRORISM

Claude Berrebi

A DISSERTATION  
PRESENTED TO THE FACULTY  
OF PRINCETON UNIVERSITY  
IN CANDIDANCY FOR THE DEGREE  
OF DOCTOR OF PHILOSOPHY

RECOMMENDED FOR ACCEPTANCE  
BY THE DEPARTMENT OF  
ECONOMICS

November 2004

UMI Number: 3151078

UMI<sup>®</sup>

---

UMI Microform 3151078

Copyright 2005 by ProQuest Information and Learning Company.  
All rights reserved. This microform edition is protected against  
unauthorized copying under Title 17, United States Code.

---

ProQuest Information and Learning Company  
300 North Zeeb Road  
P.O. Box 1346  
Ann Arbor, MI 48106-1346

© Copyright by Claude Berrebi, 2004. All rights reserved.

## Abstract

This dissertation investigates the determinants and economic impacts of terrorism, using the Israeli-Palestinian conflict as a case study.

The first chapter examines the potential link between terrorism, low education levels, and economic desperation using newly culled data of Hamas and Palestinian Islamic Jihad (PIJ) terrorist cells. Predictors of participation in terrorist activities were statistically analyzed for Israel from the late 1980s to the present. A time-series analysis of terrorist attacks in Israel with relation to economic conditions was also performed. The findings suggest that both higher education and higher standard of living are positively associated with participation in Hamas or PIJ and with becoming a suicide bomber. With regard to societal economic condition, no sustainable link could be found.

The second chapter investigates the interdependence between terrorism and electoral outcomes as an alternative explanation for terrorism levels fluctuations. We analyze a dynamic model of reputation, for which the equilibrium generates two empirical predictions. First, we predict an increase in the relative support for the rightist party after periods with high levels of terrorist activity and decreases after relatively calm periods. Second, we predict relatively higher levels of terrorism during the leftist party's tenure in office. The first hypothesis is strongly supported by the available data. For the second hypothesis the results mainly support our theoretical prediction in the studied time period. Accordingly, terrorist attacks increase during leftist governments and vice versa.

Finally, the third chapter addresses the economic consequences of terrorism. Using stock markets data, I employ scoring matching techniques and event study analysis to disentangle the impact of terrorism across different economic sectors. In particular, differentiation is made between Israeli companies that are involved in or with defense, security or antiterrorism related industries and other companies. The findings show that whereas terrorism has a significant negative impact on non-defense related companies, the overall effect of terrorism on defense and security related companies is significantly positive. These results suggest that in addition to the imminent costs suffered from terrorism, the expectation of high levels of terrorism in the future might have significant implications on the allocation of resources across industries.

## Acknowledgements

First and foremost, I would like to thank my primary advisor, Alan Krueger, for his many contributions to this work and for giving me a great deal of guidance and inspiration throughout graduate school and the following job market. I couldn't wish for more from my main advisor. I also would like to thank my two other advisors Solomon Polachek and Cecilia Rouse to whom I am forever greatly indebted. Their help, suggestions and support at various stages of this process were invaluable. They both immensely helped when I most needed it.

I thank the Industrial Relations Section that has provided both an excellent learning environment and generous financial support throughout my studies. I owe a great deal to Linda Belfield, Charlotte Howard, Joyce Howell and the students and visitors in the IR Section over the past five years.

In addition, I owe many thanks to Esteban Klor who strongly encouraged me and heavily contributed to the completion of this dissertation. While it would be impossible to thank everyone individually, I would especially like to thank my friends Yaacov Garini, Gad Levanon, Nitzan Melamed, Yaron Raviv, David Skeie and Nikola Tarashev who spent much of this period with me for the better and the worse.

Most importantly, I want to thank my family, my wife Efrat, my daughter Ariel and my son Benjamin who were the constant force that kept me going during often-difficult times, exams or endless work. They were there for me at times of failures as well as successes. The support of my wife was unconditional and

irreplaceable. The constant love I received was priceless and the key to all my achievements.

I would also like to thank my in-laws Dan and Yafa Fisher for financially supporting and believing in me, and am so sorry that Yafa cannot be among us to see the product of their investment.

Finally, a special thank is due to my parents Robert and Jacqueline Berrebi. It would just be too long if I had to appropriately stress how lucky I am to have had the best possible parents. I can, however, summarize by saying that I would not be the person I am today without the constant love and support of my parents.

## Table of Contents

Abstract.....	iii
Acknowledgements.....	v
Introduction.....	1
Chapter 1 Evidence About The Link Between Education, Poverty and Terrorism Among Palestinians.....	13
Chapter 2 On Terrorism and Electoral Outcomes: Theory and Evidence from the Israeli- Palestinian Conflict ..... (with Esteban F. Klor)	90
Chapter 3 Consequences of Terrorism: A Stock Market Analysis of Israeli Companies.....	150



## Introduction

The use of case studies in academic research has become customary. In addition to increasing knowledge of the particular details and dynamics of the study at hand, the case studies approach has the potential to contribute to a better understanding of a larger intriguing phenomenon. This dissertation follows such an approach, using Palestinian terrorism in order to better understand not only the Israeli-Palestinian conflict but also terrorism as a worldwide phenomenon. Specifically, this research address key questions on the causes and consequences of terrorism using the Israeli-Palestinian conflict as a case study.

Research on the causes and consequences of terrorism is critical in order to evaluate the conventional wisdom and common assumptions held with regard to terrorist activity. Given the potential impact of these common beliefs on policy makers and the policies they shape, it is vitally important to make sure the assumptions used are substantiated by available data when possible and are appropriate for the problem the policy is aiming to solve. For example, many people in today's global society, including many of its most prominent leaders and academics, maintain that terrorist activity is the direct result of ignorance and/or poverty. The first chapter of this dissertation investigates whether terrorism really does have roots in destitution and lack of education. Specifically, I examine correlates of Palestinian terrorist attacks against Israeli targets using micro population data and aggregate time series data. The results of this analysis are surprising and might be perceived as counterintuitive. Common sense might suggest that individuals who have "nothing to lose" (or less to lose) would be more likely to

engage in self-destructive activities. Such conventional wisdom could be the result of an intuitive comparison with previous analyses of behaviors similar to terrorist activity. For instance, one might borrow from the traditional economic theory of crime (Gary S. Becker, 1968) to analyze terrorist activity, or from the economic theory of suicide (Daniel S. Hamermesh and Neal M. Soss, 1974) to analyze suicide-bombers, or from the economics of religious sects (Eli Berman, 2000)<sup>1</sup> to explain participation in secluded terrorist groups. Using these theories in an attempt to explain terrorism might misleadingly suggest that, similar to the way that people with fewer opportunities in the legal/outside/secular world would be more likely to commit crimes, commit suicide, or join religious sects, people with fewer opportunities would likewise tend to join terrorist groups.

Notwithstanding the apparent connection between terrorism and the other economic theories described above, the empirical evidence collected so far gives little reason to believe that materialistic or educational improvements would help reduce terrorism. Much of the recent terrorism literature suggests that the forces driving individuals to engage in terrorist activity would probably not be found in economic desperation or ignorance. A report produced by the Federal Research Division (1999) concerning the sociological characteristics of Cold War-era terrorists concludes, “Terrorists in general have more than average education, and very few Western terrorists are uneducated or illiterate.” This trend is not confined by national boundaries, as seen in Charles Russell and Bowman Miller (1983), who

---

<sup>1</sup> In a recent paper, Berman himself applies a model similar to the one used to explain ultra-orthodox Jews’ behavior to Hamas and the Taliban (Berman, 2002).

draw a sociological profile of the modern urban terrorist based on analysis of over 350 individual terrorists from a diverse set of groups active during 1966-76. They found that "... approximately two-thirds of those identified terrorists are persons with some university training, university graduates or postgraduate students." (p.55)

An intriguing publication by Nasra Hassan (2001) also suggested that in the case of terrorism, the traditional models of crime, suicide, and religion might not apply. In an article summarizing her interviews of nearly 250 terrorists and associates of terrorists (including failed suicide-bombers, families of deceased bombers, and those who trained and prepared the bombers for their missions), she reported, "None of them were uneducated, desperately poor, simple minded or depressed. Many were middle class and, unless they were fugitives, held paying jobs. More than half of them were refugees from what is now Israel. Two were the sons of millionaires." Even journalists have begun to doubt the intuition that poverty and ignorance are root causes of terrorism. In an article in the *New York Times* on the characteristics of the 9/11/2001 terrorist hijackers,<sup>2</sup> Jodi Wilgoren reports that "They were adults with education and skill ... they were not reckless young men facing dire economic conditions and dim prospects but men as old as 41 enjoying middle-class lives."

Despite the suggestive evidence to the contrary, the commonly held belief continues to be that poverty (of individuals and society) and ignorance are major

---

<sup>2</sup> Wilgoren, Jodi. "After the Attacks: The Hijackers; A Terrorist Profile Emerges That Confounds the Experts." *New York Times*. Saturday, September 15, 2001, late ed.: A2.

<http://query.nytimes.com/gst/abstract.html?res=F30710F7345C0C768DDDA00894D94044>

factors contributing to the existence of terrorism. Both before and after the tragic events of September 11, 2001, many prominent observers, including U.S. and foreign officials, diplomats, and scientists and researchers of the highest ranks, have asserted the opinion that economic and educational deficiencies are among terrorism's core causes.

The need for careful research examining the relationship between poverty, education, and terrorism is clear. The groundwork for such further research began with a recent work by Krueger and Jitka Maleckova (2003), who investigate the link between poverty and low education and participation in terrorist activity. Using biographical data of 129 Hizbollah members killed in paramilitary actions in the late 1980's and early 1990's, they found that both having a standard of living above the poverty line and having a secondary-school education or higher are *positively* associated with participation in Hizbollah. Their paper clearly puts into doubt the supposed benefit of investing in the eradication of poverty or in educational attainment as a means of directly fighting terrorism.

It is important to test whether such results were specific to Hizbollah-Lebanon or whether they can be generalized to other terrorist groups, areas, and time periods. The first chapter of the dissertation attempts to verify if such results could be replicated using higher quality data relevant to terrorist activities of Hamas and PIJ in Israel and the Palestinian Authority.

To investigate further the potential link between education, poverty, and terrorism, I created a unique data set from 285 biographies of Hamas and Palestinian Islamic Jihad (PIJ) terrorists, as well as daily information on fatal terrorist attacks

against noncombatants on Israeli soil on a daily basis from January 1949 to May 2003. I merged these data with national surveys of Palestinians and other publicly available sources, and performed a statistical analysis of the determinants of participation in Hamas and PIJ terrorist activities in Israel from the late 1980's to the present. Additionally, I conducted a time series analysis of whether terrorist attacks in Israel are correlated with economic conditions. From the findings it is apparent that terrorists from these organizations are less likely to come from impoverished families (20 percent of terrorists are characterized as poor as compared to 32 percent of the general Palestinian population) and are much more likely to have completed high school and attended college than the general Palestinian population (58 percent of terrorists versus 18 percent of the Palestinian population were educated beyond high school). This relationship continues to hold when I estimate choice-based logit models to control for age, region of residence, and marital status. These findings suggest that both higher standards of living and higher levels of education are *positively* associated with participation in Hamas or PIJ. With regard to the societal economic condition, no sustainable link between terrorism and poverty and education could be found, which I interpret to mean that there is either no link or a very weak indirect link. A further analysis that differentiates between suicide bombers and other terrorists indicates similar relationships in either case between education, poverty, and terrorism.

I believe these empirical findings emerge because terrorism is a distinct phenomenon and should be studied as such. I am inclined to believe that strong

political motives combined with a subjective perception of injustice, rather than factual economic factors, are at play.

If terrorism is regarded as an extreme form of political activism, the inverse relationship with poverty and ignorance is not surprising. Daniel Lerner had already suggested this seemingly contradictory link in 1958 in a study of political activism in the Middle East, where he concluded, “The data obviate the conventional assumption that the Extremists are simply the ‘have-nots,’ suggesting rather that they are the ‘want-mores.’” (p.368). In order to assess whether or not political variables could explain better the causes of terrorism and, if so, to explore the nature of the interaction between politics and terrorism, further research in that direction was warranted.

The available data on the Israeli-Palestinian conflict can be used not only to evaluate the conventional wisdom on terrorism, education, and the economy, but also to evaluate additional possible predictors for terrorist activity. Three hundred and ninety terrorist attacks resulted in more than a thousand Israeli fatalities between November 1991 (when the Madrid Peace Conference formally initiated the peace process) and October 15, 2003. Despite its large toll in human lives, the Israeli-Palestinian conflict is not characterized by continuous and uninterrupted violence. Rather, this conflict exhibits marked fluctuation between periods of relative calm followed by bloody cycles of violence. Nowadays this conflict is going through an extremely violent period plagued with attacks and retaliations. This latest cycle of violence that began in September 2000 was preceded, however, by three very quiet years in terms of fatalities. That quiet period, in turn, was itself

preceded by a violent one which arguably began in 1994, ending the quiet years that followed the first Palestinian uprising (Intifada). The number of fatalities is not the only variable that has exhibited a cyclical behavior since the beginning of the peace process. The Israeli Prime Minister's political affiliation seems to change from the right wing party to the left wing party, and conversely, every time the office is up for grabs. While the possibility that the level of terrorism might influence electoral outcomes was already mentioned in the Israeli popular press (*Yediot Aharonot*, January 10, 2003), the previous description of events suggests that electoral outcomes influence the level of terrorism as well, thereby creating an interaction between the two variables.

The second chapter of this dissertation investigates theoretically and empirically the dynamic interaction between electoral outcomes and terrorism. The Israeli-Palestinian conflict is especially suited to conduct such a study for a number of reasons. Occupation and terrorism are the most salient issues in Israel. Democratic elections occur periodically and political parties' positions with respect to the occupied territories are fairly well known to voters and terrorists alike. Consequently, any empirical relation between terrorism and electoral outcomes is likely to be evident in this case study.

A dynamic model of reputation that captures the salient characteristics of this conflict is analyzed. The analysis emphasizes that terrorism is mainly used to impose costs on the Israelis to force them to grant emancipation. Although current costs can be substantial, it is the expectation of high levels of terrorism in the future that convinces the Israeli electorate that it is not worth maintaining the occupation.

A major contribution of the model is that it provides an explanation for relatively calm periods in addition to the violent ones. The equilibrium of the theoretical model generates two precise empirical predictions on the interaction between terrorism and electoral outcomes. First, we expect that the relative support for the rightist party increases after periods with high levels of terrorism and decreases after periods of relative calm. Second, perhaps paradoxically, the model predicts that the expected level of terrorism is higher during the leftist party's tenure in office compared to the expected level of terrorism during the rightist party's tenure in office. The intuition behind the equilibrium strategies is as follows. When Israelis believe with high probability that Hamas is in control of terrorism, they expect a high level of terrorism, whether emancipation is granted or not. Therefore Israelis, who obtain a benefit from occupation, vote for the rightist party. In this range of beliefs the Palestinian authority (henceforth PA) tries to differentiate itself from Hamas by clamping down on terrorists. That is, the PA wants to establish a reputation as a rational partner for peace. Once such a reputation is established, if the PA continued to suppress terrorism, Israelis wouldn't suffer a cost from maintaining the occupation and would thereby try to perpetuate it. This is precisely the reason that drives the PA to accommodate terrorism: to impose costs on the Israelis in order to force them to grant emancipation. Israelis expect that maintaining the occupation will lead to a stream of high-level terrorist attacks, not because they are facing Hamas, but rather because the PA is not suppressing terrorism. Given that the PA's optimal strategy is to suppress terrorism once emancipation is granted,



Israelis vote for the leftist party in this range of beliefs after observing that the PA accommodates terrorism.

Note that the empirical predictions follow from the Palestinians' strategic considerations and not from different deterrence policies that could be implemented by the Israeli government.<sup>3</sup>

Following the implications of the theoretical model, the empirical estimation concentrates on periods that precede Israeli elections, studying the interaction between the level of terrorism and electoral outcomes to explain the striking variability in the level of terrorism that has preceded different Israeli elections. Accordingly, the PA's optimal level of terrorism before an Israeli election varies depending on the identity of the political party currently holding office in Israel; we should observe a higher level of terrorism before elections when the Labor party is holding office relative to the expected level of terrorism when the Likud party is holding office. The effect of terrorism on political preferences of the Israeli electorate is also studied, a topic not directly covered in previous literature.

The first hypothesis is strongly supported by the available data obtained from public opinion polls on the Israeli electorate's intent of voting. Accordingly, a

---

<sup>3</sup>In this respect the empirical analysis is significantly different from most empirical studies of terrorism. In general, empirical studies of terrorism assume that terrorists' utilities are increasing in the level of attacks and that the observed fluctuations are a consequence of the implementation of different deterrence policies (Enders and Sandler, 1993 and 2002; Brophy-Baermann and Conybeare, 1994).

temporary marginal increase in the number of fatalities from terrorist attacks causes an increase in the support for the rightist party of 0.4 percent, evaluated at the averages. The results are not affected when we control for the identity of the party holding office. Whether the Prime Minister at the time of the attacks belongs to the rightist party has no effect on that party's relative support either.

To determine the validity of the second hypothesis, we used a combination of event study methods together with likelihood ratio tests. The main results support the theoretical prediction for three of the four Israeli governments in the studied time period. Accordingly, we observe a statistically significant increase in the level of terrorism during the leftist party's term in government and a statistically significant decrease in terrorism during the rightist party's term in government. The unity coalition government led by Ariel Sharon between March 2001 and February 2003 is the only government that exhibits a pattern of terrorism that contradicts our analytical results. Given that this government was out of the ordinary for several reasons, it should not lower our confidence that the obtained results strongly support our theoretical predictions.<sup>4</sup>

The third chapter of this dissertation provides a first attempt at analyzing the possibly differential impact of terrorism across industries in a given country. In

---

<sup>4</sup>The coalition government formed between 2001 and 2003 is a difficult government to characterize. In this period, although the prime minister belonged to the rightist party, the leftist party was not only an active partner in the ruling coalition, but also was the party with the largest representation in the Israeli parliament.

particular, the main objective is to assess whether the impact of terrorism on the defense and security related industries is different from its impact on the remaining economic sectors. To that purpose I focus on Israeli companies that traded at American markets and build, using matching score methods, a control group consisting of American companies. Using Israeli companies traded in the same market as their counterfactuals helps avoiding potential biases that exist when stock's valuation is compared across different stock markets. The valuation of each Israeli company and its assigned American "counterpart" enable me to differentiate between the effect of terrorism on companies involved in or with the defense, security or antiterrorism industries (henceforth defense related companies) and other companies.

The results show that terrorism does not have a significant impact on the average valuation of Israeli companies' stocks vis-à-vis the valuation of the control group's stocks. However, after controlling for defense related companies, the obtained impact of terrorism on these companies is positive and significant, and negative and significant for the remaining companies. The results are robust to different samples of Israeli companies, different measures of terrorism, and different econometric specifications.

This chapter contributes to the growing number of studies that, focusing on the Israeli-Palestinian conflict, attempt to quantify the economic costs of terrorism.

A fundamental problem when trying to quantify the effect of terrorism on economic fluctuations is that the obtained estimates might be biased due to a plausible interaction between the two variables. To overcome the intrinsic difficulty

of identifying the impact of terrorism, I use a propensity score matching method following Dehejia and Wahba (2002) to find the closest counterfactual stock for each of the Israeli stocks to be used as control group, and use event study approaches to assess the impact of the Israeli-Palestinian conflict on the Israeli companies' stock returns. The fluctuation in the number of casualties of the Israeli-Palestinian conflict is exploited to assess the economic impact of a terrorist attack. Using the detailed data on the daily number of terrorist attacks, I estimate the economic cost of terrorist attacks on a daily, weekly and monthly basis. Additionally the impact of terrorism is decomposed in order to identify the different effects of terrorism on defense versus non-defense related companies.

The important economic ramifications of studies along these lines cannot be overstated in a world where the proliferation of terrorism has reached unexpected levels. As an example, I conjecture that the differing effects of terrorism across industries should lead to a reallocation of resources in countries that expect to suffer long periods of violence in the future.

In sum, this dissertation attempts to rigorously examine both the causes and consequences of terrorist activity. By evaluating common beliefs on the root causes of terrorism, exploring alternative factors that potentially yield better explanations for observed fluctuations in terrorism levels, and measuring varying economic impacts of terrorism, this dissertation aims to contribute to a careful discussion of terrorism's unique characteristics.

## Chapter 1

# Evidence About The Link Between Education, Poverty and Terrorism Among Palestinians<sup>\*</sup>

Claude Berrebi

### Abstract

This paper investigates the potential link between terrorism, ignorance, and economic desperation using newly culled data of Hamas and Palestinian Islamic Jihad (PIJ) terrorist cells. The determinants of participation in terrorist activities are statistically analyzed for Israel from the late 1980s to the present. A time series analysis of terrorist attacks in Israel with relation to economic conditions is also performed. The resulting evidence suggests that both higher education and standard of living are *positively* associated with participation in Hamas or PIJ and with becoming a suicide bomber. With regard to societal economic condition, no sustainable link could be found.

Keywords: Terrorism, Poverty, Education, Hamas, Suicide-Bomber

(JEL J2)

---

\* I am grateful to Jeffery Kling, Esteban Klor, Mia Bloom, Melissa Clark, Erica Field, Ken Fortson, Jane Garrison, Gad Levanon, Alexandre Mas, Ryan Quillian, Yaron Raviv, Bradley Ruffle, and especially to Alan Krueger, Solomon Polacheck and Cecilia Rouse for the helpful advice and comments provided. The paper has also benefited from the comments of audiences at seminars and conferences too many to mention. Yaakov Garini and Eman Hassan provided invaluable help in the construction of the data set. I would like to thank Princeton University's Industrial Relations Section for its support. All views and remaining errors are solely mine.

## I. Introduction

Many people in today's global society, including many of its most prominent leaders and academics, maintain that terrorist activity is the direct result of ignorance and/or poverty. This paper investigates whether terrorism really does have roots in destitution and lack of education. Specifically, I examine correlates of Palestinian terrorist attacks against Israeli targets using micro population data and aggregate time series data. The results of this analysis are surprising and might be perceived as counterintuitive. Common sense might suggest that individuals who have "nothing to lose" (or less to lose) would be more likely to engage in self-destructive activities. Such conventional wisdom could be the result of an intuitive comparison of previous analyses of behaviors with terrorist activity. For instance, one might borrow from the traditional economic theory of crime (Gary S. Becker, 1968) to analyze terrorist activity, or from the economic theory of suicide (Daniel S. Hamermesh and Neal M. Soss, 1974) to analyze suicide-bombers, or from the economics of religious sects (Eli Berman, 2000)<sup>5</sup> to explain participation in secluded terrorist groups. Using these theories in an attempt to explain types of terrorism might misleadingly suggest that, similar to the way that people with fewer opportunities in the legal/outside/secular world would be more likely to commit crimes, commit suicide, or join the religious sects, people with fewer opportunities would likewise tend to join terrorist groups.

---

<sup>5</sup> In a recent paper, Berman himself applies a model similar to the one used to explain ultra-orthodox Jews' behavior to the Hamas and Taliban (Berman, 2002).

Notwithstanding the apparent connection between terrorism and the other economic theories described above, the empirical evidence collected so far gives little reason to believe that materialistic or educational improvements would help reduce terrorism. If anything, the correlation I find is that those with higher education and higher living standards are *more* likely to participate in terrorist activity. I believe these empirical findings emerge because terrorism is a distinct phenomenon and should be studied as such. It is not yet completely clear how to explain terrorists' motives without assuming irrational, ill or insane decision-making processes, but I am inclined to believe that strong political motives combined with a subjective perception of injustice, rather than factual economic factors, are at play.

To begin investigating the terrorist mindset, a good place to start is the widespread literature on "hate crimes", a phenomenon that many (e.g., Neil J. Kressell, 1996 and Mark S. Hamm, 1998) have considered closely related to terrorism. Donald P. Green, et al. (1998) provide evidence showing that anti-black lynchings and real GNP growth were *positively* correlated from 1882 to 1938. In addition, data from 1987 to 1995 shows that hate crimes against blacks, Jews, Asians and homosexuals were unrelated to unemployment rate in New York City. Using data about hate crime groups in the United States, Philip Jefferson and Frederic L. Pryor (1999) found that, in 1997, the probability of the existence of such groups, like the Ku Klux Klan, in a particular area was *positively* associated with the share of the population in that area with at least a high school diploma. The inverse relationship between hate crimes and poverty and/or lack of education is not confined to the U.S., as Alan B. Krueger and Jörn-Steffen Pischke (1997) found

using data from Germany that education and the average manufacturing wage were unrelated to the amount of violence against foreigners.

In addition to the work on hate crimes, a report produced by the Federal Research Division (1999) concerning the sociological characteristics of terrorists in the Cold War period concludes, “Terrorists in general have more than average education, and very few Western terrorists are uneducated or illiterate... Older members and leaders frequently were professionals such as doctors, bankers, lawyers, engineers, journalists, university professors, and mid-level government executives.” Once again the trend is not confined by national boundaries, as seen in Charles Russell and Bowman Miller (1983), who attempt to draw a sociological profile of the modern urban terrorist based on a compilation and analysis of more than 350 individual terrorists from Argentinean, Brazilian, German, Iranian, Irish, Italian, Japanese, Palestinian, Spanish, Turkish, and Uruguayan terrorist groups active during 1966-76. They found that “... approximately two-thirds of those identified terrorists are persons with some university training, university graduates or postgraduate students.” (p.55)

An intriguing publication by Nasra Hassan (2001) already suggested that in the case of terrorism, the traditional models of crime, suicide, and religion might not apply. In an article summarizing her interviews of nearly 250 terrorists and associates of terrorists (including failed suicide-bombers, families of deceased bombers, and those who trained and prepared the bombers to their missions), she reported, “None of them were uneducated, desperately poor, simple minded or depressed. Many were middle class and, unless they were fugitives, held paying



jobs. More than half of them were refugees from what is now Israel. Two were the sons of millionaires.”

Recently, people have begun to doubt the intuition that poverty and ignorance are the root causes of terrorism. In an article in the *New York Times* on the characteristics of the 9/11/2001 terrorist hijackers,<sup>6</sup> Jodi Wilgoren reports that “They were adults with education and skill ... spent years studying and training in the United States, collecting valuable commercial skills and facing many opportunities to change their minds. ... they were not reckless young men facing dire economic conditions and dim prospects but men as old as 41 enjoying middle-class lives.” Moreover, if terrorism is regarded as an extreme form of political activism, the inverse relationship with poverty and ignorance should not surprise us. Daniel Lerner had already suggested this seemingly contradictory link in 1958 following a study of political activism in the Middle East, where he concluded, “The data obviate the conventional assumption that the Extremists are simply the ‘have-nots,’ suggesting rather that they are the ‘want-mores.’” (p.368)

Despite the evidence to the contrary, the commonly held belief continues to be that poverty (of individuals and society) and ignorance are major factors contributing to the existence of terrorism. Since the tragic events of September 11, 2001, many prominent observers, including the following U.S. officials, have called

---

<sup>6</sup> Wilgoren, Jodi. “After the Attacks: The Hijackers; A Terrorist Profile Emerges That Confounds the Experts.” *New York Times*. Saturday, September 15, 2001, late ed.: A2.

<http://query.nytimes.com/gst/abstract.html?res=F30710F7345C0C768DDDA00894D9404482>

for increased financial aid and educational assistance to end terrorism by eliminating what is believed to be its core causes.

- President George W. Bush, in a speech on the closing day of a five-day U.N. conference on poverty in Monterey, Mexico on March 22, 2002: “We fight against poverty because hope is an answer to terror...We will challenge the poverty and hopelessness and lack of education and failed governments that too often allow conditions that terrorists can seize and try to turn to their advantage.”<sup>7</sup>
- First Lady Laura Bush in a speech to the Organization for Economic Cooperation and Development in Paris on May 15, 2002: “A lasting victory in the war against terror depends on educating the world's children because educated children are much more likely to embrace the values that defeat terror.”<sup>8</sup>
- Secretary of State Colin L. Powell in an official US Department of State Document dated February 14, 2002 in Washington, DC: “I fully believe that the root cause of terrorism does come from situations where there is poverty, where there is ignorance, where people see no hope in their lives.”<sup>9</sup>
- Former United States Vice President Al Gore told the Council on Foreign Relations in New York on February 12, 2002 that an ‘evil axis’ is formed

---

<sup>7</sup> <http://www.whitehouse.gov/news/releases/2002/03/20020322-1.html>

<sup>8</sup> <http://www.jewishsf.com/bk020517/iworld.shtml>

<sup>9</sup> <http://www.state.gov/secretary/rm/2002/8038.htm>

primarily by poverty and ignorance, forcing many to engage in terrorist activities.<sup>10</sup>

- Deputy Secretary of the Treasury Kenneth Dam on CBSNews in Islamabad, Pakistan on February 5, 2002: "Fighting the root causes of terrorism, poverty, and hopelessness is as important as fighting terrorism directly."<sup>11</sup>

Although some might think that these sentiments have become prevalent only after 9/11, prominent diplomats asserted such opinions prior to 2001. For example:

- Former United States President William J. Clinton in a speech to the Jordanian Parliament in October of 1994, "On one side stand the forces of terror and extremism, who cloak themselves in the rhetoric of religion and nationalism. These forces of reaction feed on disillusionment, poverty and despair."<sup>12</sup>
- Edward Djerejian, a top US diplomat and former U.S. ambassador to Syria (1988-1991) and to Israel (1993-1994): "Experience suggests to us that political Islamic movements are to an important degree rooted in worsening

---

<sup>10</sup> "For there is another Axis of Evil in the world: poverty and ignorance; disease and environmental disorder; corruption and political oppression. We may well put down terror in its present manifestations. But if we do not attend to the larger fundamentals as well, then the ground is fertile and has been seeded for the next generation of those born to hate us..." <http://www.al-gore-2004.org/gorespeeches/02122002.htm>

<sup>11</sup> <http://www.cbsnews.com/stories/2002/02/05/attack/main328279.shtml>

<sup>12</sup> <http://meria.idc.ac.il/us-policy/data1994.html>

socio-economic conditions in individual countries.”<sup>13</sup> An excerpt of the Hearing of the Subcommittee on Africa of the House Foreign Affairs Committee on May 12, 1993.

Foreign officials from all over the world seem to hold the same views regarding this linkage:

- British Prime Minister Tony Blair in a speech at the Lord Mayor's banquet, Tuesday, November 13, 2001: “The dragon’s teeth [with regards to terrorism and terrorists] are planted in the fertile soil of . . . poverty and deprivation.”<sup>14</sup>
- Gloria Macapagal-Arroyo, President of the Philippines, on MindaNews, June 12, 2002: “I will be with you, people of Lamitan on the declaration of Independence Day to declare the freedom of the people of Basilan from the bondage of poverty and terrorism.”<sup>15</sup>
- Prime Minister Ali Abul Ragheb of Jordan according to the Jordan Times on Friday and Saturday, September 21-22, 2001: “Elaborating on the causes of terrorism, the prime minister cited political, economic and social conditions, including poverty, ignorance and frustration.”<sup>16</sup>

---

<sup>13</sup> Congress, House of Representatives, Committee on Foreign Relations, *Recommendations for U.S. Foreign Assistance to Africa: Hearing before Subcommittee on Africa before the Committee on Foreign Affairs*, 103<sup>rd</sup> Congress, 1<sup>st</sup> Session, 12 May 1993, p.91.

<sup>14</sup> [http://www.usemb.gov.do/IRC/speeches/Tony\\_Blair.htm](http://www.usemb.gov.do/IRC/speeches/Tony_Blair.htm)

<sup>15</sup> <http://www.mindanews.com/2002/06/3rd/nws12indep.html>

<sup>16</sup> <http://www.jordanembassyus.org/09212001003.htm>

- Greek Alternate Foreign Minister Tassos Giannitsis from the Embassy of Greece to the U.S., May 18, 2002: “Terrorism, drugs, poverty and underdevelopment are linked directly and should be jointly handled on a global level.”<sup>17</sup>
- Shimon Peres, former Israeli Prime Minister, at a Briefing to UN Ambassadors and Senior UN Officials at the United Nations in New York on May 30, 1995: “We have to address ourselves to the young generation and to education, so that neither poverty nor ignorance will continue to feed fundamentalism, poverty, disillusion and hatred.”<sup>18</sup>
- Terje Roed-Larsen, United Nations special coordinator, according to the August/September 2001 edition of the Washington Report on Middle East Affairs, summed up his speech at the “International Media Encounter on the Question of Palestine” on June 19<sup>th</sup> by warning that “Poverty breeds hate...and hate creates violence.”<sup>19</sup>

Many scientists and researchers of the highest ranks hold the same common belief:

- Elie Wiesel, 1986 Nobel Peace Prize recipient, at a gathering of Nobel Peace Prize laureates in Oslo, Norway in December 2001: “Education is the way to eliminate terrorism.”<sup>20</sup>

---

<sup>17</sup> <http://www.greekembassy.org/press/newsflash/2002/May/nflash0518a.html>

<sup>18</sup> <http://www.israel-mfa.gov.il/mfa/go.asp?MFAH0chz0>

<sup>19</sup> <http://www.wrmea.com/archives/august-september01/0108050.html>

<sup>20</sup> <http://www.csmonitor.com/2001/1210/p7s1-wogi.htm>

- Kim Dae-jung, 2000 Nobel Peace Prize recipient and President of South Korea, at a gathering of Nobel Peace Prize laureates in Oslo, Norway in December 2001: “At the bottom of terrorism is poverty. That is the main cause.”<sup>21</sup>
- Jessica Stern, lecturer on terrorism at Harvard University's Kennedy School of Government and the author of “The Ultimate Terrorists,” in a quote from “Being Feared Is Not Enough to Keep Us Safe,” which was published in the Washington Post on Saturday, September 15, 2001: “We have a stake in the welfare of other peoples and need to devote a much higher priority to health, education, and economic development, or new Osamas will continue to arise.”<sup>22</sup>
- John O. McGinnis, from the Federalist Society for Law and Public Policy Studies, in a National Security White Paper entitled “Expanding Trade: A Powerful Weapon Against Terrorism”: “Ignorance and poverty are the greatest friends of the terrorist, because the ignorant and impoverished are easy prey for the conspiracy theories and millennial religious visions that are the staple of the Islamic fanatics. In contrast, as people become better educated and more prosperous, they will tend to oppose the arbitrary and

---

<sup>21</sup> <http://www.parliament.the-stationery-office.co.uk/pa/ld199900/ldhansrd/pdvn/lds02/text/20227-06.htm>

<sup>22</sup> [http://bcsia.ksg.harvard.edu/publication.cfm?program=ISP&ctype=article&item\\_id=270](http://bcsia.ksg.harvard.edu/publication.cfm?program=ISP&ctype=article&item_id=270)

theocratic rule promised by the terrorists as a threat to their prosperity and freedom.”<sup>23</sup>

- James Wolfensohn, President of the World Bank, was reported to say, according to the BBC, “that rich countries must build on the global war against terrorism by launching a new war on poverty.”<sup>24</sup>

The need for careful research examining the relationship between poverty, education, and terrorism is clear. The groundwork for such further research began with a recent work by Krueger and Jitka Maleckova (2003), who investigate the link between poverty and low education and participation in terrorist activity. Using biographical data of 129 Hizbollah members killed in paramilitary actions in the late 1980’s and early 1990’s, they found that both having a standard of living above the poverty line and having a secondary-school education or higher are *positively* associated with participation in Hizbollah. Their paper clearly puts into doubt the supposed benefit of investing in the eradication of poverty or in educational attainment as a means of directly fighting terrorism.

It is important to test whether such results were specific to Hizbollah-Lebanon or whether they can be generalized to other terrorist groups, areas, and time periods. In particular, this paper attempts to verify if such results could be replicated using higher quality data relevant to terrorist activities of Hamas and PIJ in Israel and the Palestinian Authority. The data used was collected from biographies of Hamas and

---

<sup>23</sup> <http://www.fed-soc.org/Publications/Terrorism/trade.htm>

<sup>24</sup> <http://news.bbc.co.uk/1/hi/business/1857642.stm>

PIJ terrorists and population survey data to investigate the link between terrorism and individual income and education. Additionally, a unique data set that accounts for each and every fatal terrorist incident against Israeli noncombatants together with Palestinian economic variables is used to investigate this link with respect to the society's economic condition.

The paper follows with a discussion of the definition of terrorism I have chosen to work with in the next section. The third section contains a short description of the different terrorist and militant groups involved in the Israeli-Palestinian conflict with an emphasis on the Hamas and PIJ because of their centrality to my research. The fourth section will provide some theoretical considerations concerning the relationship between education and income and terrorism. A description of the data I used in the different analyses makes up section five. The sixth section describes the statistical analysis used to measure the correlates of participation in Hamas and PIJ terrorist activities and the time series analysis used to estimate the relationship between economic variables and terrorist attacks. The results of the study are presented in section seven and section eight concludes the paper.



## II. Definition of Terrorism

Definitions of terrorism vary widely, and it is therefore difficult, if not impossible, to find a single definition that covers all aspects of terrorism as they exist in today's world. A certain event can be defined as an act of terror in the views of one country and at the same time be defined as a "fight for freedom" by another.

The FBI defines terrorism as "the unlawful use of force or violence against persons or property to intimidate or coerce a Government, the civilian population, or any segment thereof, in furtherance of political or social objectives."<sup>25</sup> Deluxe Black's Law Dictionary defines an act of terrorism as "An activity that involves a violent act or an act dangerous to human life that is a violation of the criminal laws...and appears to be intended - (i) to intimidate or coerce a civilian population; (ii) to influence the policy of a government by intimidation or coercion, or (iii) to affect the conduct of a government by assassination or kidnapping."<sup>26</sup>

While the above definitions encompass a wide range of terrorism, I have chosen to use the definition used by the US State Department, which is contained in Title 22 of the United States Code, Section 2656f(d):

- The term 'terrorism' means premeditated, politically motivated violence perpetrated against noncombatant (1) targets by subnational groups or clandestine agents, usually intended to influence an audience.

---

<sup>25</sup> Federal Bureau of Investigation. "Thirty Years of Terror: A Retrospective Edition." Terrorism in the United States 1999. p. i. <http://www.fbi.gov/publications/terror/terror99.pdf>

<sup>26</sup> Black's Law Dictionary, 6th Edition, p. 1473.

- The term ‘international terrorism’ means terrorism involving citizens or the territory of more than one country.
- The term ‘terrorist group’ means any group practicing, or that has significant subgroups that practice, international terrorism.

(1) For purposes of this definition, the term "noncombatant" is interpreted to include, in addition to civilians, military personnel who at the time of the incident are unarmed and/or not on duty...We also consider as acts of terrorism attacks on military installations or on armed military personnel when a state of military hostilities does not exist at the site.<sup>27</sup>

It is important to keep in mind that I have chosen to rely on the US State Department definition of terrorism in order to exploit the fact that the US State Department has already categorized and specified the set of contemporary terrorist groups ( Hamas and PIJ are currently designated by the US Secretary of State as Foreign Terrorist Organizations—FTOs). However, using any other definition that regards terrorist action as the calculated use of unexpected, shocking, and unlawful violence against noncombatants (including, in addition to civilians, off-duty military and security personnel) and other symbolic targets perpetrated by a clandestine member(s) of a subnational group or a clandestine agent(s) for the psychological purpose of publicizing a political or religious cause and/or intimidating or coercing

---

<sup>27</sup> The U.S. government has employed this definition of terrorism for statistical and analytical purposes since 1983. <http://www.state.gov/s/ct/rls/pgtrpt/2000/2419.htm>

a government(s) or civilian population into accepting demands on behalf of the cause<sup>28</sup> would not change any of the analysis since it would unarguably label Hamas and PIJ militant activities as terrorist activities. It is important to remember that in this paper, the nouns “terrorist” or “terrorists” do not necessarily refer to everyone within a terrorist organization, but to activists or operators who personally carry out a group’s terrorism strategy and their leaders.

---

<sup>28</sup> This definition was borrowed from Federal Research Division (1999), p.10.

### III. Background

The historical background and evolution of terrorist activities in the Middle East is complex, controversial and, although important, is outside the scope of this paper and should be the subject of additional research. Instead of being an exhaustive study in the history of Middle Eastern terrorist organizations, the goal of this section is to expose the different contemporary militant/terrorist forces in the Israeli-Palestinian region.<sup>29</sup>

**Al-Fatah** is a reverse acronym for “Harekat at-Tahrir al-Wataniyyeh al-Falastiniyyeh” and translates to mean “an organization for liberation of Palestine,” and the word “Fatah” itself means “conquest with jihad.” Established by Yasser Arafat circa 1960, Al-Fatah joined the PLO in 1968 and gained control in 1969. The group was based in Jordan until 1970 when it was expelled to Lebanon, and then moved again to Tunisia in 1982. The organization was active in numerous acts of terror in the 1970’s and 1980’s, but ceased these activities following the Oslo Agreement in 1993. Al-Fatah has three affiliates still carrying out terrorist activities: Al-Aqsa Martyr Brigades, Tanzim, and Force 17.

**Al-Aqsa Martyrs Brigade** was named after the Al-Aqsa Mosque in Jerusalem. The group, consisting of terrorists from the West Bank, is affiliated with Al-Fatah and was established at the beginning of the 2<sup>nd</sup> Intifada in September of 2000. The Martyrs Brigade is responsible for numerous terror activities including suicide

---

<sup>29</sup> In addition to the background provided here, it might be useful to be acquainted with the Palestinian security forces and structure as described in Appendices C and D.

bombing, sniper attacks, knife stabs and more. Al-Aqsa Martyrs Brigade has so far taken responsibility for the deaths of more than 100 Israeli civilians and the injuries of thousands.

**Tanzim**, which means “Organization,” is an armed wing of Al-Fatah and was established in 1995. The group acts to balance the activity of the extreme groups, such as Hamas and PIJ, and has served as a driving force behind a number of riots, including the 2<sup>nd</sup> Intifada. Among its terrorist activities are the ambushing of vehicles, shootings, and bus bombings. The Tanzim consists of tens of thousands of members, spread throughout the West Bank and Gaza Strip, and is funded by the Palestinian Authority. The last publicly known head of the Tanzim was Marwan Bargouti, who now stands trial in Israel for various acts of terror. Tanzim is responsible for the deaths of approximately 30 Israeli civilians and the injuries of a few hundred.

**Force 17** is the personal security force for Yasser Arafat that was established in the early 1970’s and is funded by the PLO. It is a high quality, well-trained unit consisting of approximately 3,000 members, led by Faisal Abu Sarah, with a long history of terrorist activities against Israeli targets. The unit’s first commander, Ali Hassan Salameh, took part in the 1972 Olympics massacre of the Israeli delegation. Force 17 is responsible for the deaths of more than 10 Israeli civilians in terror activities.

**Popular Front for the Liberation of Palestine (PFLP)** - Formed by George Habash in 1967, the PFLP saw the elimination of Israel as facilitating the development of communism in the Middle East. The PFLP was an original member

of the PLO, but opposed the PLO's negotiations with Israel. They are responsible for the deaths of more than 100 Israeli civilians.

**Popular Front for the Liberation of Palestine – General Command (PFLP - GC)** - The PFLP-GC split from the PFLP in 1968 under the leadership of their founder, Ahmad Za'rur. Currently led by Ahmad Jibril, they continue to reject any kind of recognition of and negotiation with Israel and are responsible for the deaths of more than 50 Israeli civilians.

**Democratic Front for the Liberation of Palestine (DFLP)** – The DFLP split from the PFLP in 1969 and supports the creation of a Palestinian state in any territory liberated from Israel. They are responsible for the deaths of more than 35 Israeli civilians.

**Hizbollah** – This radical Shiite group that was formed and operated in Lebanon, which at times infiltrates the Israeli-Lebanese border, receives funding, weapons, explosives, and recruits from Iran. Their force includes a few hundred operatives and a few thousand supporters. Hizbollah was responsible for more than 300 deaths and more than 500 injuries through its terror activities.

**Abu Nidal Organization (ANO)** - Sponsored by Iraq, Syria and Libya, the ANO advocates the destruction of Israel and uses its force of a few hundred operatives in an attempt to attain that goal. They were responsible for approximately 300 deaths and the wounding of hundreds more before the mysterious death of Abu Nidal in August 2002, which critically reduced their activities to the point that they are now thought to be inactive.

## **Hamas**

Hamas, a word meaning ‘courage’ and ‘bravery,’ is a short form in Arabic for “Harakat al-Muqawamah al-Islamiyya” – meaning “the Islamic resistance movement.” Hamas is a radical Islamic organization based in the West Bank and Gaza Strip that first registered as a non-profit organization in 1978 led by Sheik Ahmad Yassin under the influence of the Muslim Brotherhood, which was established in the 1920s in Egypt with the purpose of an Islamic “revival”. Initially, Hamas’ activities mainly involved religious propaganda and social work that was financed by Islamic supporters around the world.

When the 1<sup>st</sup> Intifada broke in December of 1987, Hamas gained momentum along with the Intifada and expanded its activities by introducing a militant faction of the organization. Hamas declared Jihad (holy war)<sup>30</sup> against Israel, with the stated purpose of destroying Israel and creating a Palestinian state between the Mediterranean Sea and the Jordan River. In pursuit of that goal, Hamas shifted the weight of its activities towards militancy, and today the overwhelming majority of Hamas’ activities are militant.

In 1991, Hamas established the Iz al-Din Al Kassam brigades, which control the military and terrorist activities including intelligence, recruitment, and training. These brigades have a network of small cells that do not communicate with each

---

<sup>30</sup> Jihad has multiple interpretations including that of internal struggle rather than only holy war. In the context of this paper, I used Jihad only when it meant waging a war in the real sense of the term.

other, so the fall of one cell will not cause the fall of others. The total estimated number of hard-core operatives is less than 400.

Hamas founder and spiritual leader Sheik Ahmad Yassin and his spokesman, Dr. Abdel Aziz Rantisi were killed by Israeli missile attacks on March 22 and April 17, 2004, respectively. Militant leaders are less likely to be publicly known, but among the known ones are Hassan Yusuf and Mohammad Deif. Some of Hamas' leaders who carried out numerous deadly terror activities against Israelis were targeted for extra-judicial execution by Israel, including Yahya Ayyash and Salah Shehada. The organization has strong financial support from three main sources: (1) unofficial bodies in Muslim countries, mostly in and around Saudi Arabia; (2) Iran; and (3) charity networks in the West Bank, Gaza Strip, and abroad.

Hamas stepped up its terrorist activities in stages. Initially, Hamas was only involved in disturbances and strikes, then it began the assassination of what it defined as "collaborators with Israel." It moved on to kidnapping and killing Israeli soldiers, then to knife attacks against soldiers and civilians, and finally to shootings, bombings, and suicide attacks in every place Israelis could be reached. Hamas took responsibility for the deaths of more than 500 Israeli civilians and soldiers in addition to thousands of injuries. Since Hamas' activities are defined as Jihad, the group does not differentiate between soldiers and civilians, young and old—everything is justified by the cause.

### **Palestinian Islamic Jihad (PIJ)**

Although there are many, the Palestinian Islamic Jihad (PIJ) is the most well known extremist group using the name Islamic Jihad. The PIJ calls for an armed



Islamic war against Israel in order to free Palestine and create an Islamic state instead of Israel. Palestinian Islamic Jihad is a translation from Arabic for “Harakat al-Jihad al-Islami al-Filastini,” which means “Movement for holy war to Palestine.”

Students, inspired by the Iranian revolution and militant Egyptian Islamic organizations, founded the PIJ around 1980 in Egypt and were led by one of the founders, Fathi Shkaki. The PIJ was active mainly in the West Bank and Gaza Strip, and initially put emphasis on Islamic culture, postponing the Palestinian issue. In the 1980’s, the PIJ started its disruptive activities, and moved on to terrorist activities that included a number of attacks in the Gaza Strip in 1987 prior to the start of the Intifada in December. As the PIJ increased its terrorist activities, two of its leaders – Shkaki and Abdul Aziz Odeh - were expelled to Lebanon in August of 1988, but Shkaki reorganized the group from there, where he also tightened the connections with Iran, PIJ’s main supporter. In addition to funding from Iran, the PIJ also receives logistic assistance from Syria.

The PIJ and Hamas were violent rivals until the establishment of the Palestinian Authority in 1994, which began a period of relatively peaceful coexistence as they both terrorized Israel. Both organizations took responsibility for some of the worst terrorist acts and as a result, the PIJ gained skill, experience, and support from the Palestinian public. Shkaki was killed in 1995 in Malta, supposedly by Israeli agents, and he was succeeded by Dr. Ramadan Abdullah Shalah, who resides in Damascus. Shkaki's death damaged the PIJ's position in Gaza Strip and the West Bank, and Hamas no longer sees it as a threatening rival. During its existence, the PIJ has claimed responsibility for over 140 Israeli deaths and more than 1,000 injuries.

#### IV. Theoretical considerations

Traditional economic considerations following Becker (1968) suggest that people with higher education and higher income have more at stake (or more to lose) from taking part in criminal activities. Such individuals, when choosing how to allocate their time between legal and illegal activities to maximize their utility, will presumably find better (and less risky) alternatives and would therefore have fewer reasons to join restrictive groups. A simplified summary of the equilibrium described in Berman (2002) would suggest that high wage individuals are less likely to be impressed by “club goods”<sup>31</sup> and are therefore less likely to make sacrifices to join exclusive organizations. Furthermore, increased knowledge (a probable result of additional education) may provide better reasoning skills, which might deter potential terrorists from engaging in militant activities.

Many other considerations have been given to support this conventional wisdom and I do not claim to have described all the main arguments and theories supporting it. However, if terrorism is considered a distinct phenomenon rather than a branch of criminal activity, there is little in economic theory to prove conclusively that a positive correlation exists between terrorist behavior and low education or income. In fact, economic theory does not stipulate whether education and income are even *linked* to terrorist activities.

---

<sup>31</sup> “Club goods” are local public goods that are excludable. In particular, non-members can be restricted from consuming it.

Despite the lack of a proven association between education, economic status, and terrorism, there are many reasons that could cause highly educated and wealthy individuals to engage in terrorist activities. Educational content (particularly that which advocates particular political or religious messages) may exacerbate existing tensions and increased exposure to such content (in the form of additional education) may increase an individual's propensity to participate in terrorist organizations. That aside, improving reasoning skills may lead to involvement in terrorist organizations because individuals with more education may be better equipped to understand moral and religious justifications invoked by such groups<sup>32</sup>. Further, highly educated individuals may be more aware of situations of injustice and discrimination, and may be more aggravated by their implications, again inducing them to participate in terrorist activities. Similarly, education may contribute to the development of a sense of social responsibility and highly educated individuals may feel the need to contribute to particular causes. If an individual is a proponent of a belief that is primarily advocated via terrorism, he may be more likely to become an active participant in terrorist activities.

In addition to the preceding argument, highly educated individuals may care more about preserving image and could be more easily swayed by public opinion in their behavior, which may lead such individuals to engage in terrorist activities if terrorism enjoys popular support. Moreover, individuals initially interested in

---

<sup>32</sup> Note however, that the same argument can be used to hypothesize that individuals with more education would recognize that there are other means available than terrorism like protests, strikes, appeals to the media, etc, and thus, would revert from terrorism.

joining terrorist organizations might be more likely to get more education in an attempt to become an active terrorist. If education improves performance in terrorist organizations, an individual with militant tendencies might acquire more education in order to be more successful in such activities. Because terrorism might require additional education, one cannot a priori dismiss the possibility that terrorism is in fact a high-skill occupation.

Terrorism may also be a means of achieving success for individuals with limited opportunities elsewhere. Therefore, terrorist organizations might attract highly successful (and, most likely, highly educated) individuals that are otherwise well qualified but cannot succeed in the non-terrorism marketplace because of their heritage, social standing, etc. (this would especially be true in non-democratic societies). It is also possible that terrorist organizations are faced with an excessive supply of potential participants and can therefore choose the select few they desire. Consequently, it may be that the potential terrorists selected by these groups are highly-educated even though, on average, the education of those willing to join such organizations may be no greater than average. Another mechanism could be that during times of rebellion such as in the first and second intifadas, highly educated individuals would be particularly frustrated by the loss of economic opportunities and the alternative economic cost of their risking arrest or worse would be lower<sup>33</sup>.

Likewise, wealth may also increase the likelihood that an individual will participate in terrorist activities. For example, terrorism may require a certain

---

<sup>33</sup> See Angrist (1995) for further details on the effect of the first intifada on the Palestinian job market.

degree of wealth because capital provides the means to carrying out acts of terror. Weapons must be acquired on the black market, which is extremely expensive (and could preclude poor individuals from participating) due to the limited access to warfare equipment in areas where terrorism is prevalent as a result of the presence of official police and army forces. In addition, wealthy individuals may be more likely to encounter barriers and restrictions in daily life (that poorer individuals might not come across) because of the opportunities that wealth provides (e.g., in governmental paperwork, access to financial markets, and commercial spheres). By being exposed to such restrictions, wealthy individuals may be more likely to become enraged by certain organizations or groups, and, therefore, may be more likely to engage in terrorist activities. Moreover, it is plausible that relatively poorer individuals are more preoccupied with daily matters, such as providing for their families, and end up devoting less attention to militant struggles.

To conclude, it cannot be dismissed that wealthy and educated individuals would be inclined to participate in terrorist activity. In fact, there is nothing in economic theory that is a priori inconsistent with evidence showing that high-education, high-income individuals are more likely to participate in terrorist activities.<sup>34</sup>

---

<sup>34</sup> In addition to individual wealth, potential pro-cyclicality of terror attacks could be explained by a tendency of the world media to focus mainly on disastrous situations. So that, in bad times enough attention is already paid to the Palestinian cause due to the worsening economic conditions. However, in better times the world media may focus on other stories from around the globe, and terrorists might feel greater urgency to act in order to attract attention.

## V. Data and Sample

### A. Terrorists' Biographical Data and its Counterfactual Population Survey Data

In my research, I have been able to translate and collect information from the biographies of 335 Palestinian Terrorists. To find the data, I tracked down “*Shahid*” (deceased “martyrs”)<sup>35</sup> publications from websites and Online Journals of the Hamas, Palestinian Islamic Jihad (PIJ), and the Palestinian National Authority (PNA)<sup>36</sup>. In addition, I have used a PIJ publication containing the biographies of 50

---

<sup>35</sup> The word deceased was intentionally added since the term martyr in this context can also be used to describe living individuals who have committed to enroll in suicide missions (a.k.a. living martyrs).

<sup>36</sup> Hamas's website <http://www.palestine-info.net/arabic/hamas/shuhda/shuhda.htm> later replaced with <http://www.palestine-info.info/arabic/hamas/shuhda/shuhda.htm>

The Hamas's military wing (Iz Al Din Al Qassam) online journal describes its “Martyrs” on [http://www.qassam.org/shohadaa/shohadaa\\_1990/photo\\_1990/1990.htm](http://www.qassam.org/shohadaa/shohadaa_1990/photo_1990/1990.htm)

to [http://www.qassam.org/shohadaa/shohadaa\\_2002/photo\\_2002/2002.htm](http://www.qassam.org/shohadaa/shohadaa_2002/photo_2002/2002.htm) for the respective years and on Hamas's Al Qassam shuhada memorial association <http://www.sabiroon.org/>.

Palestinian Islamic Jihad's online journal <http://www.qudsway.com/>, their website (“Jihad Islami”) <http://www.jihadonline.org/> and <http://www.shuhadaa.com/>

Finally, additional limited data can be found on the Palestinian authority official websites [http://www.pnic.gov.ps/arabic/quds/quds\\_e\\_martyrs.html](http://www.pnic.gov.ps/arabic/quds/quds_e_martyrs.html) and <http://www.pnic.gov.ps/arabic/quds/martyrs/martyrs.html>

(Note that most Martyrs in the PNA websites are not considered terrorists by my definition so that those sites were used only to complement data on already-identified terrorists).

PIJ leaders that were part of a group of 417 leaders and foot soldiers of terror groups that were expelled to Lebanon by Israel on December 17, 1992<sup>37</sup>. Altogether, the data consists of observations taken from the available biographies with the following breakdown:

183 “*Shahids*” of the Hamas;

103 “*Shahids*” of the PIJ, one of whom was also a Hamas member;

50 leaders of the PIJ;

In 319 of the 335 cases, the date of the biography could be determined either because it corresponded to the date of death of the “*Shahid*”, or because the terrorist was expelled to Lebanon on a known date. The date of the biography puts a “timestamp” on the data, which ranges from 1987 to 2002<sup>38</sup>. In the 319 cases where the date is known, 35 percent (111) occurred between 1992-1995 and 57 percent (183) occurred between 2000-2002.

Of the 171 observations from which it can be determined whether or not the death was the result of a planned attack, 89 percent (152) were planned attacks and 11 percent (19) were not planned attacks. Out of the planned attacks, 66 (39 percent) were suicide attacks – 43 by Hamas members, 22 by PIJ members, and one by a member of both organizations. Cases where the attack was not planned include

---

<sup>37</sup> The analysis was repeated without the terrorist organizations’ leaders and solely including pre-meditated attacks. The results were similar and are available from the author upon request.

<sup>38</sup> The first biography is dated October 6, 1987 and the latest biography I have included in the data set is dated May 6, 2002 (I have continued to collect the biographies published since, but more recent biographies await translation).

attacks initiated by the Israeli Defense Forces (IDF) and attacks carried out during or after resisting arrest. In the cases where it was clear that the “*Shahid*’s” death was the result of an IDF extra-judicial execution (targeted assassination), it was necessary to check available resources to determine whether the “*Shahid*” had committed previous terror attacks or been arrested, in order to establish his presence, or lack thereof, on the list of terrorists. In addition, 95 of the observations included information about the existence or non-existence of a will; approximately 93 percent (88) included a will showing that the “*Shahid*” knew his death was near.

Out of the 335 biographies, 114 gave specific details on whether or not the individual participated in one or more previous attacks. Of those 114, 96 percent (109) participated in previous terror attacks, leaving only five biographies indicating clearly that the “*Shahid*” had no prior terrorist activity. Also, out of the 173 cases in which it was known whether or not the individual had been arrested for participating in terrorist activity, 91 percent (158) had been arrested previously.

From 284 observations that give a clear indication of rank in the organization, 68 percent (193) were foot soldiers and 32 percent (91) were leaders. The leader category includes cell commanders in charge of cells of 3-6 foot soldiers. All available biographies are of males, of which 32 percent (106) were married, 39 percent (132) were single, and there was no information for the remaining 29 percent (97). The biographies describe men covering a very wide spectrum of



professions, from doctors to teachers to unskilled workers, as well as full-time employees of terror organizations, i.e., Hamas and PIJ.<sup>39</sup>

54 percent (168) of the terrorists lived in urban localities and 23 percent (73) lived in refugee camps. For the 306 cases in which the place of birth is known, 96 percent (293) were born in the West Bank or Gaza Strip. Out of the 284 for which both place and year of birth are known, 25 percent (71) were born while the territories were under Jordanian rule (West Bank) or Egyptian Rule (Gaza Strip), and 75 percent (213) were born after the territories were under Israeli rule.

In 215 biographies the terrorist's religion was either clearly indicated or could be deduced indirectly from the information, and in all cases, the individual was Muslim. The religion was not indicated in the rest of the biographies, but it is reasonable to assume that the others were Muslims as well, given the nature of the organizations to which they belonged (both Hamas and PIJ are religious Muslim organizations and their militant activity is defined as Jihad—a Muslim, religious war)<sup>40</sup>. In addition, there were 165 biographies with descriptions of some kind of religious studies.

Inferring poverty status presented more of a challenge. Although some biographies clearly implied an individual's poverty status in statements such as "he lived in poverty" or "he was a wealthy man," this was not the case for all

---

<sup>39</sup> Employment for terrorist organizations was later excluded from analyses of labor force participation and unemployment.

<sup>40</sup> Jihad has multiple interpretations including that of internal struggle rather than only holy war. In the context of this paper, I used Jihad only when it meant waging a war in the real sense of the term.

observations. When possible, poverty status was inferred from available information on the individual's occupation, foreign travel history (e.g., traveled abroad), car ownership, computer availability, etc. For example, in one biography it was mentioned that the individual dropped out of college due to financial burdens, on another biography it was mentioned that the individual owned a new car which he used for weapon's smuggling. In such cases, I classified the former as poor while not the latter. In other cases I relied on family background descriptions, such as parents' occupations, to infer poverty status. For example, one biography described the financial dependency of the individual's family on charity networks since his father was sick and couldn't afford paying the medical bills, on another biography it was mentioned that the individual's family owned a successful luggage factory and that the father is one of the wealthiest businessmen in the area. Once again, I classified the former as poor while not the latter. Poverty status information could be inferred for approximately 69 percent (230) of all cases.

One of the advantages in using the method of data collection from reports about "*Shahids*" derives from the fact that reporting about the "*Shahid*" is a divine obligation, and according to Islam it is considered a sin if one does not hail a "*Shahid*".<sup>41</sup> As a result, it is probably safe to assume that most of the militants from the terrorist organizations that died were reported in one way or another. Therefore, by collecting the data from the organizations' own publications and newspapers,

---

<sup>41</sup> Ergun M. Caner, professor of theology and church history at Criswell College in Dallas and co-author of "Unveiling Islam" with his brother Emir, used a similar argument when asked if he was sure that Osama Bin Laden was still alive after the US bombings in Afghanistan.

some information should exist for each and every “*Shahid*” that belonged to the organizations.<sup>42</sup>

Obtaining data on the general population in the West Bank<sup>43</sup> and Gaza Strip for the relevant period proved to be difficult as well since these areas were divided and partially controlled by different non-coordinating authorities at different periods. The latest reliable and organized data available, which includes all residents of West Bank and Gaza living in households, excluding Israeli residents living in these areas, was for 1993 from the “Labor Force Surveys in Judea, Samaria and Gaza” (ISDC 1995),<sup>44</sup>. The sampling methods and definitions used in this Survey are similar to those used in the Israeli Labor Force Surveys.

This survey of households in the West Bank and Gaza Strip has been continually conducted by the Central Bureau of Statistics from August 1968 to September 1995, when each household was investigated four times over six quarters. The survey consisted of two investigations during two consecutive quarters and, after a break of two quarters, two additional investigations. The household questionnaire contains

---

<sup>42</sup> Although biographies probably exist for every “*Shahid*”, some did not contain any relevant data that could be used for statistical analysis.

<sup>43</sup> Israel officially calls these areas Judea and Samaria.

<sup>44</sup> This data was used and collected under the supervision of Joshua Angrist. See Angrist (1995) for details. The Palestinian Central Bureau of Statistics (PCBS) collected later data (e.g. the 1997 census). However, following PCBS’ recommendations, this data should not be used in comparison with previously collected data due to methodological differences in collection. More importantly, the data collected by the PCBS include only those areas under Palestinian Authority control at the time the survey was administrated.

details of household composition and dwelling. The personal questionnaire (answered by persons aged 15 and over) includes basic demographic as well as labor force characteristics and job location (in Israel or in the territories, and wages of workers).

Due to the events of the 1<sup>st</sup> Intifada in the West Bank and Gaza Strip area from the end of 1987 through 1991, enumeration suffered from difficulties of coverage as well as from fewer quality responses. Also, since the April-June 1994 Survey, the data does not contain population figures from the autonomous areas of Gaza and Jericho (i.e. a significant part of the area relevant for a control group has been under PNA control since 1994). These facts combined with the facts that more than a third of the Hamas and PIJ biographies with known publication dates are from the 1992-95 period and 96 percent (293) of the 306 individuals for whom place of residence was known resided in the West Bank or Gaza Strip made me consider the 1993 survey population of similar age, sex and religion to be the most appropriate control group available. Another advantage to using the “Labor Force Surveys in Judea, Samaria and Gaza” is the size of the 1993 survey sample (99,193 observations)<sup>45</sup> and its quality.

Because the sample of terrorists contained only Muslim males between 15 and 56 years old, I have restricted the survey sample to the 41,762 Muslim males between the ages of 15 and 56 as well.

In the last decade, the income levels of the inhabitants of the West Bank and Gaza Strip deteriorated due to political and security reasons caused by the ongoing

---

<sup>45</sup> Refers to unique observations.

conflict in the region. Therefore, the use of control group data from 1993 instead of more recent data may, if anything, under-represent the poor in the population.

With respect to educational attainment it was not a priori evident that it did not rise in the last few years, something that, if true, would make the use of control group data from 1993 inappropriate. A comparison was then performed between the educational distribution of the Palestinian population in the relevant ages obtained from the 1993 survey sample and the distribution obtained from a survey collected by the Palestinian Center for Policy and Survey Research (PCPSR) from December 19 to 24, 2001.<sup>46</sup> From the comparison displayed in Appendix B, it is clear that, if anything, educational attainment was lower in 2001 compared to 1993. Therefore, once again, the use of control group data from 1993 instead of more recent data may, if anything, under-represent the less educated in the population.

The following potential problems with the terrorist biographical data and the survey data are worth emphasizing:

- There is no indication in the “Labor Force Surveys in Judea, Samaria and Gaza” whether or not an individual is also engaged in Hamas or PIJ terrorist activities. However, I estimate the Hamas and PIJ active militants to represent less than 1 in 1,000 people and suicide-bombers to represent less than 1 in 100,000 people in the relevant gender, age, and religious group of the population. I ignore the

---

<sup>46</sup> The questionnaire and aggregate results are available from:

<http://www.pcpsr.org/survey/polls/2001/p3a.html>

Alan Krueger, Professor of Economics at Princeton University, provided the breakdown of this data by educational level.

fact that, in principle, some individuals of the survey sample may have belonged to those terrorist groups as well.

- Most of the deceased terrorists died during a planned terrorist attack on their part; however, some died due to Israeli targeted assassinations. Since targeted terrorists are presumably of higher rank, and thus higher income and/or education, the results might suffer from a bias that would be introduced by the overestimation of relatively better off terrorists. In order to evaluate this potential bias, all tests were repeated using only the 157 observations for which I knew from the biography that the attack was premeditated. The results remained identical in signs and statistically significant.
- Because of the division of labor within any organization, different activities are assigned according to one's rank. Assuming that lower ranking terrorists are assigned riskier tasks, it is probable that the share of low ranked soldiers within the set of deceased is larger than their share in the organization. If so, my sample would under-represent the number of highly educated terrorists from middle or upper income families.
- Another consideration might be given to a potential reporting bias. One might suspect that since these biographies are intended to hail the deceased they would refrain from publishing facts that might be considered unflattering or humiliating. In fact, the suspicions increase when one reads the many lengthy descriptions of the deceased's devotion to the religion and to the cause, which never mention the possible doubts in the goals or the means that they employed. Also, the clearly exaggerated glorifications indicating the bravery of the

deceased adds to the suspicion of reporting objectivity bias. It is not clear, however, if descriptions of one's wealth would be exaggerated in a society where being poor is associated with humbleness. In fact, in biographies in which poverty is mentioned, it is clearly emphasized with pride. Some biographies, however, indicated wealth with pride, suggesting that it was associated with a position of respect for the deceased and his family. If anything, it seems that extremities on both sides might be over represented, since average wealth or income might not add to the glorification and commemoration process. To overcome this problem, one would ideally want to have another, orthogonal source of reporting for comparison. To the best of my knowledge, no additional sources exist. In the only case where an individual's biography was reported by both the Hamas and the PIJ, the articles tended to be in agreement.

- An additional problem arises from the fact that variables of interest (i.e. schooling and poverty) for some individuals were inferred on the basis of existing information. For example, I used the type of last school attended or the highest degree achieved in order to infer the number of years of schooling. Thus, the data may not be perfectly comparable.
- Potentially the most significant problem is the fact that in most cases poverty status of terrorists was inferred from variables indicating one's wealth. However, the population survey data did not give any information on the individual's (or the family's) accumulated wealth. Ideally, I would use an identical variable, from both the population survey data and for the "*Shahids*" biographical data, indicating if a minimum substance level is met or not. In the

absence of such a variable, monthly wage was used to determine poverty status in the population survey. On the one hand, the measures are hardly comparable, but on the other hand, we also know from theoretical works (John P. Danforth, 1979) as well as empirical evidence (Hans G. Bloemen and Elena G. F. Stancanelli, 2001) that higher levels of wealth result in higher reservation wages, thus higher wages for the ones employed. Moreover, the criteria for being considered poor among the population survey has been increased in an attempt to ‘bend the curve backward,’ whereas I have classified a ‘*Shahid*’ above poverty only when the biography indicated possessions or a standard of living that would not be possible when destitute. So, only individuals with extremely low wages were considered poor in the survey population.<sup>47</sup> The cutoff point was set at the point that someone earning such a wage could not possibly afford to maintain the assets possessed by the above-poverty terrorists. For example, owning a car would not be possible due to maintenance costs alone, travels abroad would be out of reach, etc. Additional exogenous information, such as the very limited fraction of the population that has access to a car (approx. 20 percent) or a computer (approximately 4 percent)<sup>48</sup>, would suggest that, when comparing to the terrorists’ data, the share of the above-poverty in the general population has been overestimated. In fact, the level of

---

<sup>47</sup> In order to be categorized as poor, one had to earn less than 40 percent of the Israeli minimum wage, which is approximately equal to 18 percent of the Israeli average wage.

<sup>48</sup> Palestinian Central Bureau of Statistics – Table 25: Percentage of Palestinian Households By Availability of Some Durable Goods (1997).



poverty I obtained from the population survey data (31 percent) is significantly lower than other source estimates<sup>49</sup>.

### *B. Time Series Terrorist Attacks and Economic Indicators Data*

For time series analysis purposes, an additional data set was constructed containing daily information on each and every fatal<sup>50</sup> terrorist attack against noncombatants<sup>51</sup> that occurred on Israeli soil<sup>52</sup> from 1949 to January 31, 2003. Every attack is described by date, method of operation, location, terrorist organizations claiming responsibility, and additional data about the victims, such as age, gender, and place of residence. The procedure in which the data was collected was as follows:

First, data was gathered from the Israeli Foreign Ministry<sup>53</sup> (IFM), which publicly provides a list containing major terrorist attacks for which the description is fairly detailed, although it lacks information in some cases. Since the information

---

<sup>49</sup> A report from January 2003 produced by William Bell, a Christian Aid policy officer for Palestine and Israel, finds that “Almost three-quarters of Palestinians now live on less than US\$2 a day – below the official UN poverty line.”

<http://www.christianaid.org.uk/indepth/0301isra/losing.htm>

<sup>50</sup> Due to the collection procedure constraints, only attacks in which someone besides the terrorist died were included.

<sup>51</sup> The term noncombatant is interpreted to include, in addition to civilians, military personnel who at the time of the incident are unarmed and/or not on duty.

<sup>52</sup> This includes occupied territories when under Israeli control.

<sup>53</sup> <http://www.israel-mfa.gov.il/mfa/home.asp>

provided by the Israeli Foreign Ministry only covers certain time periods, it was necessary to search for data from other sources. I chose the information provided by the National Insurance Institute of Israel<sup>54</sup> (NIII) for the time periods that data from the Israeli Foreign Ministry was unavailable. The main reason I chose the NIII to create a continuous data set is because it is regulated by the government, and is therefore very reliable. In fact, the NIII is obligated by law<sup>55</sup> to track every registered death and compensate relatives in cases of deaths caused by terrorist attacks<sup>56</sup>. The lack of inaccuracies and perfect continuity of the NIII data persuaded me to rely heavily on this source even though it imposed extensive further research as described below.<sup>57</sup>

---

<sup>54</sup> The National Insurance Institute of Israel is Israel's counterpart to the U.S. Social Security Administration. <http://www.btl.gov.il/>

<sup>55</sup> The author's free translation is: The law of benefits to victims from hostilities, 1970.

חוק התגמולים לנפגעי איבה תש"ל 1970

<sup>56</sup> The law specifies that any Israeli citizen or resident, or a person who entered Israel legally, who was injured by an act of hostility, is eligible for benefits. Monthly Dependent's Benefits are paid to the widows or parents of a person who passed away due to a hostile action. Hostile action injury/death - an injury/death due to an act of hostility by enemy forces or under circumstances in which there was reasonable fear of hostile actions, as well as injury/death caused by a weapon that was intended for hostile actions - all conditional upon approval by the authority appointed by the Ministry of Defense that this is a hostile action.

<sup>57</sup> I have compared the data collected from the Israeli Foreign Ministry with the data collected from the NIII and found no case of discrepancy.

The information provided by the NIII concerns deceased individuals on a case-by-case basis<sup>58</sup>. Each death appeared on a different file and, when all necessary information was not included for a particular case, additional newspaper archival research was required in order to distinguish the case as a victim of a terrorist attack (versus other acts of hostility) and to be included in the data set. Additional research in Israeli newspapers such as Ha'aretz and Ma'ariv, which obviously had to be translated,<sup>59</sup> was also necessary to gather relevant data on the attacks, such as location, type of attack, organizations claiming responsibility, etc. (this information was not provided by the NIII, since they deal with the individual victims and not the perpetrators). Another source of data came from the Israeli Defense Forces (IDF). The IDF keeps most of its data confidential, so access to the more detailed, classified data proved impossible. Therefore, only the publicly provided summarized data was used for cross-reference purposes. To the best of my knowledge, this is the most accurate, comprehensive, unclassified dataset available regarding fatal terrorist attacks against noncombatants on Israeli soil<sup>60</sup>. The data includes information on 1,857 fatalities from 883 attacks<sup>61</sup>.

---

<sup>58</sup> <http://www.laad.btl.gov.il/>

<sup>59</sup> The practice of providing an English version of the daily issues of Ha'aretz and Ma'ariv is fairly new (English archives do not go back more than a few years when available). Similarly, local English written newspapers were at most available for half of the analyzed period.

<sup>60</sup> A summary of attacks and deaths appears in Appendix A.

<sup>61</sup> This includes 515 deaths from 75 suicide attacks.

Data from the ICBS (Israeli Central Bureau of Statistics), the PCBS (Palestinian Central Bureau of Statistics), and the CIA World Factbook was used to obtain the size of the Israeli and Palestinian populations, the total area controlled by Israel at the time of the attacks, and additional economic variables regarding the Palestinian population at time of attacks, such as GDP and average wage.

As with the biographical data, potential problems arise with the time series terrorist attacks data and the economic variables data that are worth emphasizing.

- The time series terrorist attack data includes only attacks in which someone besides the terrorist died, so that foiled attacks as well as “unsuccessful” attacks in terms of producing casualties, as well as terrorist attacks outside Israel<sup>62</sup> are not counted. Since we are interested in the variables inducing participation in terrorist activities and not necessarily “successful” or local terrorist activities, we might be omitting relevant terrorist events. In addition, fatal attacks for which the perpetrator remained unknown are counted. Such attacks should not be included if not committed by Palestinians or if committed by Palestinians who do not live in the Palestinian territories, and thus are not directly affected by the economics of the region.
- The economic indicator variables data was collected from different sources since no one source could provide continuous data for the region. The differences between the sources in their methodology, definitions and the actual geographic area they covered might be significant and could potentially reduce

---

<sup>62</sup> Including occupied territories.

the validity of any year-to-year comparison. I have tried to control for this problem by introducing dummy variables for the different sources.

Despite the limitations of the different data sets, the sample of terrorists does provide information on the characteristics of individuals engaged in Hamas and PIJ terrorist activities (and suicide-bombers in particular), while the time series analysis can help answer the broader questions about the links between economic conditions and terrorism.

## VI. Estimation Strategies

As previously discussed, one goal of this paper is to incorporate covariates and estimate the correlates of participation in Palestinian terrorist ( Hamas and Palestinian Islamic Jihad) activities in general as well as the correlates of becoming a Hamas or PIJ suicide-bomber, in particular. The data used was extracted from terrorists' biographies as well as the "Labor Force Surveys in Judea, Samaria and Gaza" from which I have drawn a relevant comparison group<sup>63</sup>.

Preliminary tabulations of demographic characteristics broken down by the groups of interest (i.e., terrorists or suicide-bombers versus the general population) suggest that there are differences between the general population and the terrorist sample. A Chi-square test performed on each of the relevant characteristics refers to a test of the null hypothesis that the characteristic is independent of terrorist status.

In order to see if the tabulation results hold statistically when introducing control characteristics I used a logistic probability model. Specifically, I model the effect of suspected variables of influence (i.e. schooling and poverty status) on the outcome ( $y_i$ ) as:

$$y_i = x_i\beta_1 + schooling_i\beta_2 + poverty_i\beta_3 + e_i$$

where  $y_i$  is a discrete variable that equals 1 if the outcome is positive (e.g., if the individual participated in Hamas or PIJ terrorist activities), and equals 0 otherwise.  $y_i$  might be a function of several other observed characteristics,  $x_i$ , which include age, marital status, place of residence, employment status, etc., so those variables

---

<sup>63</sup> See section V for details about the data and the collection procedure.

were included when found fit. The coefficients  $\beta_2$  and  $\beta_3$  would then be the logistic estimates of schooling and poverty status, respectively, on the dependent variable. From these coefficients, the slope (marginal effect) can be easily calculated. However, this setup presents a classic problem of choice-based sampling because the terrorists were selected for inclusion in the sample on the basis that the dependent variable of the logistic equation equals one. Consequently, the sample does not constitute a random sample and the estimates will generally be inconsistent (Charles Manski and Steven Lerner, 1977). Weighting the data by the ratio of the estimated relative frequencies of the subjected groups in the population to their relative frequencies in the sample should yield consistent estimates<sup>64</sup>.

For the purpose of analyzing the effect of economic condition on the number of terrorist attacks, a panel of economic indicators and time series data on terrorist attacks for the matching periods<sup>65</sup> is implemented. Because the number of attacks is a count variable, a linear regression model is inappropriate. Since I could not assume a priori equality of the conditional mean and variance functions, I estimated a negative binomial regression model.

Specifically, I modeled the bivariate relationships as:

$$\log(y_i) = \beta x_i + e_i$$

---

<sup>64</sup> Krueger and Maleckova (2003) encountered the exact same problem; I am following their suggested methodological technique to create consistent estimates.

<sup>65</sup> See section V for details about the data and the collection procedure. The length of the period analyzed in each case was set by the period for which the economic variables were to be found.

where  $y_t$  is the number of terrorist attacks in year  $t$ , and  $x_t$  is the economic indicator (e.g., GDP growth, the log of the average wage, etc.) for year  $t$ . In cases where the economic indicator variables were taken from two different sources (e.g., the ICBS and the PCBS), a dummy variable was used to control for the possibility of incongruous values that could result from differences in collection methods between the sources. The relationship then becomes

$$\log(y_t) = \beta_1 x_t + \beta_2 d_t + e_t$$

where  $d_t$  is the dummy variable for year  $t$ . Similarly, if the data was taken from three different sources, I included two dummies, one for every additional source. I also tested for the inclusion of a time trend, and repeated all estimations when controlling for population changes (i.e., including the log of population size on the right-hand side).

In the case of suicide attacks, any time series analysis would have been much less reliable due to the relatively short period at hand<sup>66</sup>, but I was able to double the number of observations by splitting the data into two main regions (i.e., Gaza and the West Bank). This was feasible because for most suicide attacks<sup>67</sup>, I

---

<sup>66</sup> The first suicide bombing attack in Israel is usually attributed to Sahar Tamam Nabulsi, who on April 16, 1993 used his truck as a guided bomb. This event, however, is not accounted for in my time series data since no one except the perpetrator died in the incident. Depending on the exact definition of fatal suicide attack, the number of observations (years) could range from 9 (1994-2002) to 14 (1989-2002). This does not account for one event on December 11, 1974, which cannot conclusively be identified as a suicide attack.

<sup>67</sup> As of January 2003, for the 75 fatal suicide attacks since 1989 (68 since April 1994), the attack originated from the West Bank in 47 cases (45 cases since 1994) and from Gaza in 15 cases (10



was able to identify the place from which the terrorist originated (i.e., his place of residence). The identification was done by matching the dates of attacks from the time series data set with the dates of deaths from the biographies data set.<sup>68</sup> I then used the variability in the economic performance and the number of suicide attacks originating from the two regions to model the relationship as follows:

$$\log(y_{r,t}) = \beta x_{r,t} + e_{r,t}$$

where  $y_{r,t}$  is the number of suicide attacks in which the terrorist's place of residence is  $r$  in year  $t$ , and  $x_{r,t}$  is the value of the economic variable for region  $r$  in year  $t$ .

---

since 1994). In 2 other cases the suicide attacker was known to be from another region, and for the other 11 cases the origin of the attacker remained unknown.

<sup>68</sup> Additional information was compared to validate the match.

## VII. Sample Descriptive Statistics and Estimation Results

### A. Correlates of participation in Palestinian terrorist ( Hamas and Palestinian Islamic Jihad) activities:

#### 1. *Sample Descriptive Statistics*

Table 1 reports the means of selected demographic variables for Palestinian ( Hamas and PIJ) terrorists and the Palestinian population of similar age, sex and religion, as were tabulated using the data set culled from the terrorists' biographies as well as the "Labor Force Surveys in Judea, Samaria and Gaza". Each characteristic's category is followed by a Chi-square test of the null hypothesis that the characteristic is independent of terrorist status.

An interesting finding of this data is that 31 percent of the Palestinians, compared to only 16 percent of the terrorists, were characterized as poor<sup>69</sup>. Second, out of 208 observations where information about the terrorist's education was available, 96 percent (200) have at least a high school education and 65 percent (135) have some kind of higher education, compared to 51 percent and 15 percent, respectively, in the Palestinian population of same age, sex and religion.

Third, age of the terrorists was either directly indicated in the biographies as the age of death (for those who died), the age at expelling time (for those that were

---

<sup>69</sup> See section V for the way that individual's economic status was inferred in each of the populations and the potential problems introduced by it.

expelled to Lebanon), or it was computed from the date of publication and the date of birth, when available. Age at or just prior to the time of publication was known or possible to compute for 296 of the terrorist biographies. The Palestinian population contains a larger share of its individuals at prime time earning ages (58 percent between 25 and 54 years of age) when compared to the terrorists (only 51 percent in the same age range). Compared to the general population, terrorists tend to be younger: where only 72 percent of the general population is below the age of 34, 93 percent of terrorists fall into this group. These age-distribution differences make the finding described previously (of differences in poverty and education) even more striking.

Fourth, terrorists tended to be from urban areas (54 percent of the 311 observations where this information was available), whereas only 34 percent of the Palestinian population was living in urban areas. In particular, 47 percent of the terrorists lived in Gaza, compared to only 22 percent of the comparable population.

Fifth, only 45 percent of the terrorists were married, compared to an average of 59 percent in the population of individuals with similar age, sex and religion<sup>70</sup>. Finally, out of 142 observations where information about labor force status of the terrorists was known, 94 percent held some kind of employment,<sup>71</sup> whereas only 69 percent of the Palestinian population was employed. The right hand portion of the table reports the means when the sample is restricted to include only individuals between 18 and 41 years of age (slightly more than 94 percent of the Hamas and PIJ

---

<sup>70</sup> One should remember, however, the different age distribution mentioned earlier.

<sup>71</sup> Employment does not include employment in terrorist organizations.

sample fall under this age range), and not to include the 50 PIJ leaders deported on December 17, 1992. The means of the restricted sample do not differ significantly from the ones obtained using the more inclusive sample.

Table 2 shows similar findings when characteristics of only suicide-bombers are compared to the characteristics of the Palestinian population of same age, sex and religion. The table also displays the results when the sample is restricted to include only individuals between 17 and 28 years of age (slightly more than 90 percent of the suicide-bombers sample fall under this age range).<sup>72</sup> Similar findings are obtained when the characteristics of Hamas terrorists and the PIJ terrorists are compared separately with the characteristics of the Palestinian population of the same age, sex and religion<sup>73</sup>.

## *2. Estimation Results*

Table 3 provides logistic estimates using the pooled sample of terrorists (Hamas and PIJ) and the “Labor Force Surveys in Judea, Samaria and Gaza” of 1993. The dependent variable equals one if the individual is a Hamas or PIJ terrorist, and zero otherwise<sup>74</sup>. The first three columns present the unweighted estimates and the last three columns present the weighted, consistent estimates. All estimates are statistically significant, and suggest that poverty is inversely related, and education

---

<sup>72</sup> None of the 50 PIJ leaders deported on December 17, 1992 became suicide-bombers, so that their exclusion was irrelevant.

<sup>73</sup> Available from the author upon request.

<sup>74</sup> Refer to section VI for more details about the estimation strategy and the problem of choice-based sampling.

is positively related, with the likelihood that someone becomes a Hamas or PIJ terrorist. The results remain similar and identical with respect to sign and significance of the coefficients when the sample is restricted not to include the 50 PIJ leaders deported on December 17, 1992, and to include only individuals between 18 and 41 years of age (Table 4).<sup>75</sup>

Table 5 presents the logistic estimates of the same analysis with regard to Hamas and PIJ suicide-bombers. The results are similar in terms of the directions of the effects and are all statistically significant, as well. Restricting the sample to include only individuals 17-28 years old did not alter the results (Table 6).

Introducing regional and marital status dummy variables into the equations improved the log likelihood fitness of the estimations, plus both dummies were statistically significant. An additional potentially valid control variable, the type of residence (refugee camp versus urban or rural localities), was insignificant once the regional dummy was included. Moreover, the inclusion of the type of residence dummy did not change any of the other results in terms of the signs or significance of the coefficients.

---

<sup>75</sup> The analysis was repeated including only individuals who died in premeditated attacks. Results are similar and available from author upon request.

B. The effect of economic condition on the number of terrorist attacks:

1. *Estimation Results of Time Series Analysis*

Table 7 provides the coefficients of the negative binomial regression of the number of terrorist attacks (as the dependent variable) and the annual logarithm of the average wage (as the independent variable of interest). At first, the annual average wage was *positively* correlated with the number of terrorist attacks, but the coefficient was insignificant. Introducing a dummy variable to control for the possible differences of measures in the levels of the average wage when collected from different sources caused the effect to remain *positive* and become statistically significant at the 15 percent significance level. These results are very sensitive to specification, as is apparent from columns 3, 4 and 5. Adding control variables brings back the *positive* correlation, but the coefficients remain insignificant.

The estimates from a repetition of the above exercise using growth in GDP per capita<sup>76</sup> as the independent variable, instead of the annual logarithm of average wage can be found in Table 8. The results show that the number of terrorist attacks moved *pro-cyclically* (i.e. higher GDP growth was associated with a higher level of attacks) and the positive association becomes significant when controlling for the possible differences of measures in the levels due to the different sources, for the changes in population, and for a possible time trend.

---

<sup>76</sup> The analysis was replicated with GNP data instead of GDP in order to avoid potential biases due to changes in the Palestinian labor force opportunities in Israel. Results remained similar.

Table 9 contains the estimates of the analysis of suicide attacks when the economic variable of interest is the lagged growth in GDP per capita. The analysis of suicide attacks required additional sophistication due to the short period at hand.<sup>77</sup> Since GDP data were available for the West Bank and Gaza separately, two regions that jointly account for 94 percent of the suicide attacks for which I could identify the perpetrator's residence of origin, the suicide attacks data was split according to the perpetrator's residence between the two regions and analyzed with respect to the economic variables of the corresponding region. Hence, I was able to double the number of observations using the variability in the economic performance of the regions. For 6 of the 41 relevant suicide attacks, the region from which the perpetrator originated could not be identified; and in the case of 2 other attacks the perpetrator originated from outside the West Bank and Gaza. The first analysis using current GDP per capita growth yielded insignificant results under all the specifications. However, considering the one year lagged effect, as presented in Table 9, yields significant results when controlling for the possible differences of measures in the levels due to the different sources and for a possible time trend.

---

<sup>77</sup> The first fatal suicide attack accounted for in my time series data occurred on July 6, 1989. On a yearly basis until 2002 (inclusive), this would yield a maximum of 14 observations. However, reliable GDP data for 1993, the year in which the ICBS ceased surveying the Gaza strip and Jericho while the Palestinian authorities were not yet prepared to start their own orderly surveys and statistics, is missing. Moreover, data for 2002 was not yet available at time of writing this section.

Allowing a different level and slope between the two regions causes the significance level to improve. In all cases the number of suicide attacks moved *pro-cyclically*.

Since it is conceivable that an increase in GDP or lagged GDP per capita would have a different impact, when compared to a decrease of those variables, on the tendency to carry out terrorist attacks, a dummy variable was introduced to the previously described models. The dummy equaled one for an increase in GDP or lagged GDP per capita, and zero otherwise. When introduced by itself and when included in a product with the main variable of interest, the dummy ended up being insignificant.



## VIII. Conclusion

If there is a link between income level, education, and participation in terrorist activities, it is either very weak or in the opposite direction of what popular belief suggests. According to the findings of this paper, there is no reason to believe that increasing the years of schooling or raising the income level of individuals, without simultaneously modifying the educational content and monitoring (or at least limiting) the possible use of any additional income, will decrease the trend towards terror, the level of terror, or using means of terror.

The importance of the use of education to fight terror is not invalidated, in spite of these disappointing findings, which suggest that increasing years of school enrollment and attainment of higher degrees by itself does not reduce the probability of participation in terrorist activities, and possibly increases participation. On the societal level, the findings are weaker and subject to different interpretations. However, in my opinion, the relationships are the same in direction, although much more complex.

Policy makers, when trying to reduce terrorism via education or income, should focus not on the amount of education but on the content of education; changing the substance when needed in order to create positive stimulations towards democracy, moderation, appeasement and coexistence. Not all education is equal, and as Martin Luther King, Jr. once said in another context, “education which stops with efficiency may prove the greatest menace to society. The most dangerous criminal

may be the man gifted with reason but with no morals.”<sup>78</sup> It is sometimes obvious how educational tools are used to breed terrorism. Examples of this can be seen through excerpts from the schoolbooks of the Official Palestinian Authority education system. To demonstrate this point I have chosen a few quotes out of the official Palestinian Authority textbooks<sup>79</sup> (inciting parts/words are underlined):

- “Know, my son, that Palestine is your country... that its pure soil is drenched with the blood of Martyrs ...Answer this: Why must we fight the Jews and drive them out of our land?” [Our Arabic Language for Fifth Grade #542, p. 64-66]
- “Determine what is the subject, and what is the predicate, in the following sentences: The Jihad is a religious duty of every Muslim man and woman.” [Our Arabic Language for Fifth Grade #542, p. 167]
- “This religion will defeat all other religions and it will be disseminated, by Allah's will, through the Muslim Jihad fighters.” [Islamic Education for Seventh Grade #564, p. 125]

---

<sup>78</sup> From Martin Luther King, Jr.’s speech to Morehouse College in 1948 on “The Purpose of Education.”

<http://www.stanford.edu/group/King/publications/papers/vol1/470200->

[The\\_Purpose\\_of\\_Education.htm](http://www.stanford.edu/group/King/publications/papers/vol1/470200-The_Purpose_of_Education.htm)

<sup>79</sup> Material provided by “The center for monitoring the impact of peace”:

<http://www.matchh.org/articles/pa-report.htm>

This organization is clearly not unbiased, but because I am using only the provided quotes from the original textbooks and do not rely on their interpretations, I have no reason to suspect inaccuracies.

The excerpts are ordered by grade level.

- “Bayonets and Torches ... In your left hand you carried the Koran, And in your right an Arab sword ... Without blood not even one centimeter will be liberated. Therefore, go forward crying: Allah is great.” [Reader and Literary Texts for Eighth Grade #578, p. 102]
- “Indeed, Satan has, in the eyes of many people, made their evil actions appear beautiful... Such a people are the Jews ...” [Islamic Education for Eighth Grade #576, p. 95]
- “My brothers! The oppressors [Israel] have overstepped the boundary. Therefore Jihad and sacrifice are a duty ... are we to let them steal its Arab nature ... Draw your sword ... let us gather for war with red blood and blazing fire ... Death shall call and the sword shall be crazed from much slaughter ... Oh Palestine, the youth will redeem your land...” [Reader and Literary Texts for Eighth Grade #578, p. 120-122]
- “Martyred Jihad fighters are the most ... honored people, after the Prophets...” [Reader And Literary Texts for Tenth Grade #607, p. 103]
- “The clearest examples of racist belief and racial discrimination in the world are Nazism and Zionism.” [Modern Arab History for Twelfth Grade, Part I #648, p. 123]

A quick overview of the content shown above is enough to let us suspect that in this case educational tools are used to breed terrorism among the Palestinian Youth. In addition, a major part of one’s education is shaped or at least influenced at home. While school can only do so much to put contents into an already molded structure,

this structure sometimes tends to be in support of terrorist activities and will find it easy to legitimize them.

The London-based Arabic-language daily Al-Sharq Al-Awsat published an interview with Umm Nidal, the mother of the “*Shahid*” [martyr] Muhammad Farhat<sup>80</sup>. When asked the question: "Did you have a role in the planting of this spirit [of becoming a suicide-bomber] in Muhammad?" Umm Nidal answers: "Allah be praised, I am a Muslim and I believe in Jihad. Jihad is one of the elements of the faith and this is what encouraged me to sacrifice Muhammad in Jihad for the sake of Allah. My son was not destroyed, he is not dead; he is living a happier life than I. ... Because I love my son, I encouraged him to die a martyr's death for the sake of Allah... Jihad is a religious obligation incumbent upon us, and we must carry it out."

Another blatant example was when Yassar Arafat's (president of the Palestinian Authority) wife, Suha, said in an interview on April 12, 2002 with London's Arabic-language newspaper Al Majall that if she had a son, there would be "no greater honor" than for him to be a suicide-bomber. Any educational system supportive of concepts like the one mentioned above would, in my opinion, only increase the probability of engaging in terrorist activities.

Similarly, economic prosperity will not eliminate terrorism by itself. If individuals have no restrictions on what they may or may not do with their increased income, they may use it to buy more and improved weapons and increase their

---

<sup>80</sup> Al-Sharq Al-Awsat (London), June 5, 2002

English translation can be found at

<http://memri.org/bin/articles.cgi?Page=archives&Area=sd&ID=SP39102>

terrorist activities. Perhaps surprisingly, even extreme expression of terrorist acts such as suicide attacks seems to follow improvements and not deteriorations in economic conditions. Policy makers, once again, should promote the creation of a strictly enforced judicial system in order to ensure that wealth is channeled to the right places.

## References

- Angrist, Joshua D. "The Economic Returns to Schooling in the West Bank and Gaza Strip" *The American Economic Review*, December 1995, 85 (5), pp.1065 – 1087.
- Becker, Gary S. "Crime and Punishment: An Economic Approach." *The Journal of Political Economy*, March-April 1968, 76 (2), pp.169-217.
- Berman, Eli. "Sect, Subsidy and Sacrifice: An Economist's View of Ultra-Orthodox Jews." *Quarterly Journal of Economics*, August 2000, 115 (3), pp.905-953.
- \_\_\_\_\_. " Hamas, Taliban and the Jewish Underground: An Economist's View of Radical Religious Militias." National Bureau of Economic Research (Cambridge, MA), Rice University, October 2002.
- Bloemen, Hans G. and Elena G. F. Stancanelli. "Individual Wealth, Reservation Wages, and Transitions into Employment." *Journal of Labor Economics*, April 2001, 19 (2), pp.400-439.
- Danforth, John P. "On the Role of Consumption and Decreasing Absolute Risk Aversion in the Theory of Job Search." In S.A. Lipmann and J.J. McCall, eds., *Studies in the Economics of Search*. North Holland: Amsterdam, 1979, pp.109-31..
- Ehrlich, Isaac. "Participation in Illegitimate Activities: A Theoretical and Empirical Investigation." *The Journal of Political Economy*, May-June 1973, 81 (3), pp.521-565.

- Federal Research Division. *The Sociology and Psychology of Terrorism: Who Becomes a Terrorist and Why?* Report authored by Rex. A. Hudson, Library of Congress, September 1999.
- Green, Donald P., Jack Glaser, and A. Rich. "From lynching to gay-bashing: The elusive connection between economic conditions and hate crime." *Journal of Personality and Social Psychology*, 1998, 75 (1), pp.82-92.
- Hamermesh, Daniel S. and Neal M. Soss. "An Economic Theory of Suicide." *The Journal of Political Economy*, January-February 1974, 82 (1), pp.83-98.
- Hamm, Mark S. "Terrorism, Hate Crime, and Antigovernment Violence: A Review of the Research." In *The Future of Terrorism: Violence in the New Millennium*. London: SAGE, 1998, pp. 59-96.
- Hassan, Nasra. "An Arsenal of Believers." *The New Yorker*. November 19,2001, pp.36-41.
- Iannaccone, Laurence R. "Introduction to the Economics of Religion." *Journal of Economic Literature*, September 1998, 36 (3), pp.1465-1495.
- Israel Social Sciences Data Center–ISDC. *Israeli Central Bureau of Statistics: Labor Force Survey in Judea, Samaria and Gaza 1981-1995*. Issued by the ISDC and the Hebrew University of Jerusalem, 1995.
- Jefferson, Philip, and Frederic L. Pryor. "On the Geography of Hate." *Economics Letters*, December 1999, 65 (3), pp.389-395.
- Lerner, Daniel. *The Passing of Traditional Society*. The Free Press, 1958.
- Kressel, Neil J. *Mass Hate: The Global Rise of Genocide and Terror*. New York: Plenum Press, 1996.

- Krueger, Alan B. and Jitka Maleckova. "Education, Poverty, and Terrorism: Is There a Casual Connection?" *Journal of Economic Perspectives*, Fall 2003, 17 (4), pp.119-144.
- Krueger, Alan and Jörn-Steffen Pischke. "A Statistical Analysis of Crime Against Foreigners in Unified Germany." *Journal of Human Resources*, Winter 1997, 32 (1), pp.182-209.
- Manski, Charles and Steven Lerner. "The Estimation of Choice Probabilities from Choice Base Samples." *Econometrica*, November 1977, 45 (8), pp. 1977-1988.
- Russell, Charles and Bowman Miller. "Profile of a Terrorist." Reprinted in *Perspectives on Terrorism*. Wilmington, Delaware: Scholarly Resources Inc., 1983, pp. 45-60.
- Viscusi, Kip W. "The Risks and Rewards of Criminal Activity: A Comprehensive Test of Criminal Deterrence." *Journal of Labor Economics*, July 1986, 4 (3, Part 1), pp.317-340.



**Table 1**

Characteristics of Palestinian ( Hamas and PIJ) terrorists and Palestinian population of similar age, sex and religion.

Characteristics	Unrestricted				Restricted <sup>1</sup>			
	Hamas and PIJ terrorists	No. of obs.	Palestinian population Age 15-56 Males and Muslims	No. of obs.	Hamas and PIJ terrorists	No. of obs.	Palestinian population Age 18-41 Males and Muslims	No. of obs.
<b>Poverty</b>		230		19590		163		16195
Poor	0.16		0.31		0.20		0.32	
Average	0.41		0.48		0.40		0.48	
Well	0.33		0.20		0.30		0.20	
Very Well	0.10		0.00		0.10		0.00	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Age</b>		246		41762		230		30585
15 - 17	0.04		0.12		---		---	
18 - 24	0.51		0.28		0.55		0.39	
25 - 34	0.37		0.32		0.40		0.43	
35 - 44	0.06		0.17		0.05		0.18	
45 - 54	0.01		0.09		---		---	
55 - 56	0.00		0.01		---		---	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Education</b>		208		40278		144		29992
Primary school	0.04		0.21		0.04		0.19	
Intermediate	0.00		0.28		0.00		0.27	
Secondary	0.31		0.35		0.38		0.36	
Vocational	0.08		0.01		0.03		0.01	
Post-secondary	0.01		0.06		0.02		0.08	
Academic institute	0.56		0.08		0.53		0.09	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Residence Type</b>		311		41762		225		30585
Urban	0.54		0.34		0.52		0.33	
Rural	0.23		0.54		0.20		0.54	
Refugee camps	0.23		0.13		0.28		0.13	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			

Characteristics	Unrestricted				Restricted <sup>†</sup>			
	Hamas and PIJ terrorists	No. of obs.	Palestinian population Age 15-56 Males and Muslims	No. of obs.	Hamas and PIJ terrorists	No. of obs.	Palestinian population Age 18-41 Males and Muslims	No. of obs.
<b>School Enrollment Status</b>		231		41762		164		30585
Studied previously	0.71		0.81		0.69		0.88	
Presently studies	0.29		0.16		0.31		0.10	
Never studied	0.00		0.03		0.00		0.02	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Marital Status</b>		238		41762		214		30585
Married	0.45		0.59		0.33		0.60	
Divorced	0.00		0.00		0.00		0.00	
Widowed	0.00		0.00		0.00		0.00	
Single	0.55		0.41		0.67		0.40	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Labor Force Status</b>		142		41759		92		30583
Full-time emp.	0.90		0.60		0.88		0.64	
Part-time emp.	0.04		0.06		0.05		0.06	
Absent from work	0.00		0.03		0.00		0.03	
Unemployed	0.00		0.06		0.00		0.07	
Not in labor force	0.07		0.25		0.07		0.19	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>District of Residence</b>		306		41762		224		30585
Gaza	0.47		0.22		0.53		0.22	
Judea Samaria	0.49		0.78		0.43		0.78	
Northern	0.01		0.00		0.00		0.00	
Central	0.00		0.00		0.00		0.00	
Southern	0.00		0.00		0.00		0.00	
Jerusalem	0.03		0.00		0.03		0.00	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			

Chi-square test refers to a test of the null hypothesis that the characteristic is independent of Hamas and PIJ status.  
<sup>†</sup> only individuals between 18-41 years of age were included, and 50 PIJ leaders deported on Dec 17, 92 were not included.

**Table 2**

Characteristics of Palestinian ( Hamas and PIJ) Suicide bombers and Palestinian population of similar age, sex and religion.

Characteristics	Unrestricted				Restricted <sup>1</sup>			
	Suicide bombers	No. of obs.	Palestinian population Age 16-50 Males and Muslims	No. of obs.	Suicide bombers	No. of obs.	Palestinian population Age 17-28 Males and Muslims	No. of obs.
<b>Poverty</b>		48		18803		45		8947
Poor	0.13		0.32		0.13		0.40	
Average	0.54		0.48		0.56		0.45	
Well	0.25		0.20		0.24		0.15	
Very Well	0.08		0.00		0.07		0.00	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Age</b>		63		39824		57		19905
15 - 17	0.06		0.13		0.05		0.10	
18 - 24	0.68		0.30		0.75		0.60	
25 - 34	0.22		0.33		0.19		0.30	
35 - 44	0.00		0.18		---		---	
45 - 50	0.03		0.06		---		---	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.052			
<b>Education</b>		44		37824		42		19593
Primary school	0.02		0.20		0.02		0.15	
Intermediate	0.00		0.28		0.00		0.26	
Secondary	0.36		0.36		0.38		0.44	
Vocational	0.05		0.01		0.05		0.01	
Post-secondary	0.02		0.07		0.02		0.05	
Academic institute	0.55		0.08		0.52		0.07	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Residence Type</b>		64		38875		55		19905
Urban	0.53		0.34		0.53		0.32	
Rural	0.17		0.54		0.13		0.55	
Refugee camps	0.30		0.13		0.35		0.13	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			

Characteristics	Unrestricted				Restricted <sup>†</sup>			
	Suicide bombers	No. of obs.	Palestinian population Age 16-50 Males and Muslims	No. of obs.	Suicide bombers	No. of obs.	Palestinian population Age 17-28 Males and Muslims	No. of obs.
<b>School Enrollment Status</b>		48		38875		45		19905
Studied previously	0.50		0.83		0.47		0.77	
Presently studies	0.50		0.15		0.53		0.22	
Never studied	0.00		0.03		0.00		0.01	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			
<b>Marital Status</b>		50		38875		46		19905
Married	0.16		0.58		0.11		0.33	
Divorced	0.00		0.00		0.00		0.00	
Widowed	0.00		0.00		0.00		0.00	
Single	0.84		0.42		0.89		0.67	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.020			
<b>Labor Force Status</b>		24		38872		21		19903
Full-time emp.	0.96		0.61		0.95		0.52	
Part-time emp.	0.00		0.06		0.00		0.06	
Absent from work	0.00		0.03		0.00		0.03	
Unemployed	0.00		0.06		0.00		0.08	
Not in labor force	0.04		0.24		0.05		0.31	
	p-value for chi-sq test = 0.013				p-value for chi-sq test = 0.003			
<b>District of Residence</b>		62		38875		53		19905
Gaza	0.45		0.22		0.51		0.21	
Judea Samaria	0.47		0.78		0.47		0.79	
Northern	0.02		0.00		0.00		0.00	
Central	0.00		0.00		0.00		0.00	
Southern	0.00		0.00		0.00		0.00	
Jerusalem	0.07		0.00		0.02		0.00	
	p-value for chi-sq test = 0.000				p-value for chi-sq test = 0.000			

Chi-square test refers to a test of the null hypothesis that the characteristic is independent of Suicide bomber status.  
<sup>†</sup> only individuals between 17-28 years of age were included.

**Table 3**

Logistic Estimates of Participation in Hamas and PIJ

Dependent Variable is 1 if Individual is a Hamas or PIJ terrorist, and 0 Otherwise

Standard errors shown in Parentheses, marginal effects are presented in brackets.

	Unweighted Estimates			Weighted Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-6.079*** (0.393)	-6.152*** (0.405)	-6.695*** (0.441)	-5.763*** (0.361)	-5.836*** (0.367)	-6.348*** (0.359)
Education	0.533*** (0.028) [0.001]	0.519*** (0.029) [0.001]	0.493*** (0.030) [0.001]	0.531*** (0.035) [0.001]	0.516*** (0.034) [0.011]	0.489*** (0.034) [0.001]
Poverty (1=yes)	-0.869*** (0.211) [-0.001] <sup>†</sup>	-0.928*** (0.213) [-0.001] <sup>†</sup>	-1.043*** (0.224) [-0.001] <sup>†</sup>	-0.842*** (0.209) [-0.002] <sup>†</sup>	-0.898*** (0.207) [-0.002] <sup>†</sup>	-1.015*** (0.220) [-0.002] <sup>†</sup>
Age	-0.189*** (0.016) [-0.000]	-0.191*** (0.016) [-0.000]	-0.143*** (0.020) [-0.000]	-0.183*** (0.020) [-0.000]	-0.184*** (0.019) [-0.000]	-0.138*** (0.020) [-0.000]
Gaza (1=yes)	---	1.149*** (0.163) [0.002] <sup>†</sup>	1.295*** (0.174) [0.002] <sup>†</sup>	---	1.121*** (0.162) [0.004] <sup>†</sup>	1.253*** (0.175) [0.004] <sup>†</sup>
Married (1=yes)	---	---	-0.926*** (0.222) [0.001] <sup>†</sup>	---	---	-0.909*** (0.209) [0.002] <sup>†</sup>
Pseudo R2	0.3612	0.3801	0.3776	0.3718	0.3906	0.3881
Number of obs.	19810	19810	19789	19810	19810	19789

Notes: Sample size is 42097. Sample pools together observations on Hamas and PIJ and the general population from 1993 Labor Force Survey in Judea, Samaria and Gaza (ICBS). Weights used in columns (4), (5) and (6) are relative share of Hamas and PIJ in population to their share in the sample and relative share of survey respondents in the population to their share in the sample. Weight is 0.12566 for Hamas and PIJ sample and 0.080491 for the survey sample.

(<sup>†</sup>) dy/dx is for discrete change of dummy variable from 0 to 1.

(\*\*\*) significant at 5% significance level.

(\*\*) significant at 10% significance level.

(\*) significant at 15% significance level.

**Table 4**

Logistic Estimates of Participation in Hamas and PIJ – sample restricted: only individuals between 18-41 years of age were included, and the 50 PIJ leaders deported on December 17, 1992 were not included.

Dependent Variable is 1 if Individual is a Hamas or PIJ terrorist, and 0 Otherwise

Standard errors shown in Parentheses, marginal effects are presented in brackets.

	Unweighted Estimates			Weighted Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-5.479*** (0.500)	-5.603*** (0.523)	-6.878*** (0.606)	-5.199*** (0.463)	-5.318*** (0.485)	-6.562*** (0.520)
Education	0.572*** (0.035) [0.001]	0.547*** (0.035) [0.000]	0.502*** (0.037) [0.000]	0.566*** (0.044) [0.001]	0.540*** (0.043) [0.001]	0.494*** (0.043) [0.001]
Poverty (1=yes)	-0.567*** (0.223) [-0.001]†	-0.649*** (0.226) [-0.000]†	-0.768*** (0.240) [-0.001]†	-0.536*** (0.216) [-0.001]†	-0.615*** (0.217) [-0.001]†	-0.736*** (0.234) [-0.001]†
Age	-0.247*** (0.022) [-0.000]	-0.246*** (0.023) [-0.000]	-0.153*** (0.029) [-0.000]	-0.237*** (0.029) [-0.001]	-0.236*** (0.028) [-0.001]	-0.143*** (0.031) [-0.000]
Gaza (1=yes)	---	1.435*** (0.187) [0.001]†	1.724*** (0.204) [0.003]†	---	1.403*** (0.183) [0.005]†	1.679*** (0.197) [0.005]†
Married (1=yes)	---	---	-1.540*** (0.280) [-0.002]†	---	---	-1.533*** (0.267) [-0.004]†
Pseudo R2	0.3612	0.3913	0.4043	0.3705	0.4005	0.4141
Number of obs.	16358	16358	16339	16358	16358	16339

Notes: Sample size is 42097. Sample pools together observations on Hamas and PIJ and the general population from 1993 Labor Force Survey in Judea, Samaria and Gaza (ICBS). Weights used in columns (4), (5) and (6) are relative share of Hamas and PIJ in population to their share in the sample and relative share of survey respondents in the population to their share in the sample. Weight is 0.12566 for Hamas and PIJ sample and 0.080491 for the survey sample.

(†) dy/dx is for discrete change of dummy variable from 0 to 1.

(\*\*\*) significant at 5% significance level.

(\*\*) significant at 10% significance level.

(\*) significant at 15% significance level.

**Table 5**

Logistic Estimates of being a suicide bomber

Dependent Variable is 1 if Individual is a suicide bomber, and 0 Otherwise

Standard errors shown in Parentheses, marginal effects are presented in brackets.

	Unweighted Estimates			Weighted Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-4.781*** (0.871)	-4.757*** (0.915)	-6.701*** (1.076)	-6.804*** (0.648)	-6.869*** (0.631)	-8.913*** (0.752)
Education	0.746*** (0.070) [0.000]	0.702*** (0.070) [0.000]	0.659*** (0.074) [9.37e-06]	0.724*** (0.095) [9.22e-07]	0.743*** (0.084) [5.06e-07]	0.707*** (0.085) [3.42e-07]
Poverty (1=yes)	-1.452*** (0.499) [-0.000] <sup>†</sup>	-1.488*** (0.501) [-0.000] <sup>†</sup>	-1.522*** (0.507) [-0.000] <sup>†</sup>	-1.521*** (0.501) [-1.60e-06] <sup>†</sup>	-1.631*** (0.497) [-9.11e-07] <sup>†</sup>	-1.717*** (0.507) [-6.77e-07] <sup>†</sup>
Age	-0.436*** (0.052) [-7.22e-06]	-0.431*** (0.052) [-7.29e-06]	-0.301*** (0.061) [-4.28e-06]	-0.444*** (0.069) [-5.66e-07]	-0.480*** (0.063) [-3.27e-07]	-0.351*** (0.064) [-1.70e-07]
Gaza (1=yes)	---	1.605*** (0.365) [0.000] <sup>†</sup>	1.912*** (0.382) [0.000] <sup>†</sup>	---	1.959*** (0.377) [2.83e-06] <sup>†</sup>	2.445*** (0.394) [3.15e-06] <sup>†</sup>
Married (1=yes)	---	---	-2.525*** (0.711) [-0.000] <sup>†</sup>	---	---	-2.681*** (0.664) [-3.18e-06] <sup>†</sup>
Pseudo R2	0.4740	0.5009	0.5240	0.4110	0.4444	0.4642
Number of obs.	19637	19637	19635	19637	19637	19635

Notes: Sample size is 41828. Sample pools together observations on suicide bombers and the general population from 1993 Labor Force Survey in Judea, Samaria and Gaza (ICBS). Weights used in columns (4), (5) and (6) are relative share of suicide bombers in population to their share in the sample and relative share of survey respondents in the population to their share in the sample. Weight is 0.006338 for suicide bombers sample and 0.079977 for the survey sample.

(<sup>†</sup>) dy/dx is for discrete change of dummy variable from 0 to 1.

(\*\*\*) significant at 5% significance level.

(\*\*) significant at 10% significance level.

(\*) significant at 15% significance level.

**Table 6**

Logistic Estimates of being a suicide bomber – sample restricted: only individuals between 17-28 years of age were included.

Dependent Variable is 1 if Individual is a suicide bomber, and 0 Otherwise

Standard errors shown in Parentheses, marginal effects are presented in brackets.

	Unweighted Estimates			Weighted Estimates		
	(1)	(2)	(3)	(4)	(5)	(6)
Intercept	-6.398*** (1.338)	-6.700*** (1.389)	-8.072*** (1.493)	-7.301*** (1.193)	-8.482*** (1.184)	-9.747*** (1.337)
Education	0.819*** (0.079) [0.000]	0.779*** (0.080) [0.000]	0.703*** (0.082) [0.000]	0.742*** (0.106) [0.000]	0.788*** (0.089) [0.000]	0.726*** (0.089) [9.19e-06]
Poverty (1=yes)	-1.359*** (0.502) [-0.001] <sup>†</sup>	-1.396*** (0.507) [-0.000] <sup>†</sup>	-1.476*** (0.511) [-0.000] <sup>†</sup>	-1.467*** (0.510) [-0.000] <sup>†</sup>	-1.557*** (0.507) [-0.000] <sup>†</sup>	-1.699*** (0.518) [-0.000] <sup>†</sup>
Age	-0.398*** (0.068) [-0.000]	-0.383*** (0.070) [-0.000]	-0.261*** (0.080) [-0.000]	-0.425*** (0.094) [-0.000]	-0.432*** (0.074) [-9.29e-06]	-0.324*** (0.088) [-4.10e-06]
Gaza (1=yes)	---	1.724*** (0.380) [0.001] <sup>†</sup>	2.003*** (0.400) [0.001] <sup>†</sup>	---	2.238*** (0.402) [0.000] <sup>†</sup>	2.606*** (0.413) [0.000] <sup>†</sup>
Married (1=yes)	---	---	-2.291*** (0.786) [-0.001] <sup>†</sup>	---	---	-2.401*** (0.730) [-0.000] <sup>†</sup>
Pseudo R2	0.4452	0.4787	0.4987	0.3788	0.4245	0.4398
Number of obs.	8992	8992	8990	8992	8992	8990

Notes: Sample size is 41828. Sample pools together observations on suicide bombers and the general population from 1993 Labor Force Survey in Judea, Samaria and Gaza (ICBS). Weights used in columns (4), (5) and (6) are relative share of suicide bombers in population to their share in the sample and relative share of survey respondents in the population to their share in the sample. Weight is 0.006338 for suicide bombers sample and 0.079977 for the survey sample.

(<sup>†</sup>) dy/dx is for discrete change of dummy variable from 0 to 1.  
 (\*\*\*) significant at 5% significance level.  
 (\*\*) significant at 10% significance level.  
 (\*) significant at 15% significance level.



**Table 7**

Negative binomial regression for the number of terrorists attack

Standard errors are presented in parenthesis. The economic variable of interest, in this case the logarithm of the annual average wage, was obtained from three different sources<sup>1</sup>.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Log (average wage)</b>	0.693 (1.165)	1.558* (0.995)	-0.891 (1.235)	-0.818 (0.936)	-0.033 (1.024)	0.897 (1.344)	0.006 (1.013)	0.096 (1.028)
<b>source dummy 1</b>		0.880*** (0.321)	-0.510 (0.573)	-1.442*** (0.595)	-1.613*** (0.580)	0.703** (0.401)	-1.554*** (0.568)	-1.595*** (0.574)
<b>source dummy 2</b>						-0.314 (0.422)	0.602* (0.369)	0.420 (0.557)
<b>year dummy</b>			0.075*** (0.026)		-0.075* (0.050)			-0.033 (0.075)
<b>log(popsiz)</b>				2.828*** (0.661)	4.738*** (1.434)		3.419*** (0.729)	4.072*** (1.669)
<b>Constant</b>	-1.330 (6.706)	-6.587 (5.752)	-141.845*** (47.792)	-13.162*** (4.881)	116.862 (86.417)	-2.644 (7.880)	-22.410*** (7.294)	36.950 (136.308)
<b>Number of obs.</b>	30	30	30	30	30	30	30	30

(\*\*\*), (\*\*), (\*) and (°) refers to the significance level at 5%, 10% and 15% respectively.

<sup>1</sup>Source 1- The Central Bureau of Statistics, Statistical Abstract of Israel, as published on table 3.13 in "The Economies of the West Bank and Gaza Strip", Fawzi A. Gharaibeh, Westview Press 1985. for the years 1971-1980.

Source 2- computation from the "Labor Force Surveys in Judea, Samaria and Gaza" for the period 1981-1993.

Source 3- Palestinian Central Bureau of Statistics for the period 1995-2001.

**Table 8**

Negative binomial regression for the number of terrorists attack.

Standard errors are presented in parenthesis. The economic variable of interest, in this case the annual GDP per capita growth rate, was obtain from two different sources<sup>1</sup>.

	(1)	(2)	(3)	(4)	(5)	(6)
<b>GDP pc growth</b>	0.158 (0.515)	0.315 (0.527)	0.402 (0.569)	0.460 (0.484)	0.169 (0.532)	1.048*** (0.453)
<b>source dummy</b>					0.770*** (0.286)	-2.123*** (0.796)
<b>year dummy</b>		0.029*** (0.012)		-0.071** (0.037)		-0.171*** (0.051)
<b>log(popsize)</b>			0.952*** (0.302)	2.716*** (0.965)		7.406*** (2.011)
<b>constant</b>	2.671*** (0.145)	-54.845*** (23.434)	-4.364*** (2.215)	122.893** (66.234)	2.416*** (0.153)	288.296*** (88.152)
<b>Number of obs.</b>	32	32	32	32	32	32

(\*\*\*), (\*\*), (\*) refers to the significance level at 5%, 10% and 15% respectively.

<sup>1</sup>Source 1- Israel Central Bureau of Statistics for the period 1969-1992.

Source 2- The CIA world fact book for the period 1994-2001.

I did not compute the 1993 GDP per capita growth because it would assume possible comparison of the GDP levels between the two sources.

**Table 9**

Negative binomial regression for the number of suicide terrorists attack.

Standard errors are presented in parenthesis. The economic variable of interest, in this case the lagged logarithm of the annual GDP per capita growth, was obtained from two different sources<sup>1</sup>.

	(1)	(2)	(3)	(4)	(5)	(6)
<b>Lagged (GDP pc growth)</b>	0.488 (0.897)	1.090 (0.879)	2.151** (1.119)	2.150** (1.143)	3.350*** (1.361)	3.950*** (1.493)
<b>Lag [(GDP pc gr) *wb]</b>					-2.070* (1.322)	-2.716** (1.444)
<b>source dummy</b>			-2.507 (1.749)	-2.507 (1.749)	-3.090** (1.773)	-3.421** (1.766)
<b>year dummy</b>		0.196* (0.102)	0.494*** (0.231)	0.495*** (0.232)	0.558*** (0.232)	0.582*** (0.229)
<b>wb dummy</b>				-0.003 (0.735)		0.658 (0.699)
<b>constant</b>	0.159 (0.409)	-392.231** (202.927)	-985.557*** (460.920)	-985.744*** (462.762)	-1111.711*** (461.780)	-1160.665*** (456.466)
<b>Number of obs.</b>	22	22	22	22	22	22

(\*\*\*), (\*\*), (\*) refers to the significance level at 5%, 10% and 15% respectively.

<sup>1</sup>Source 1- Israel Central Bureau of Statistics for the period 1989-1992.

Source 2- The CIA world fact book for the period 1994-2001.

## Appendix A

Figure 1

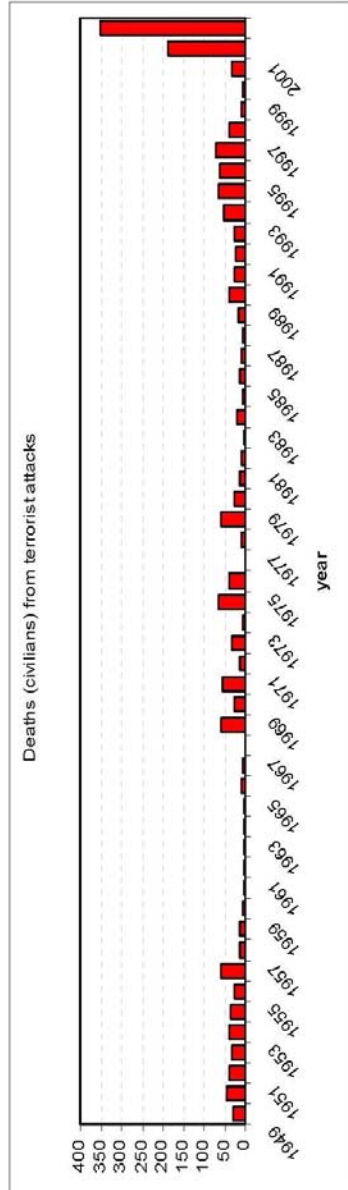


Figure 2

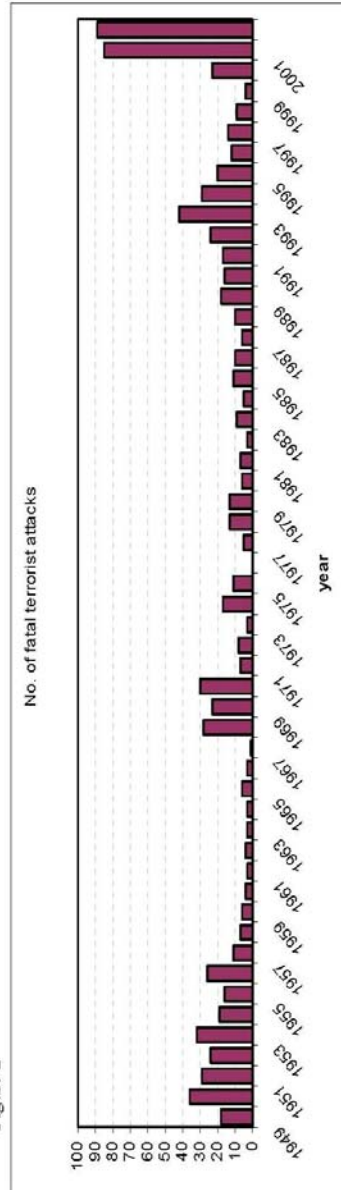


Figure 3

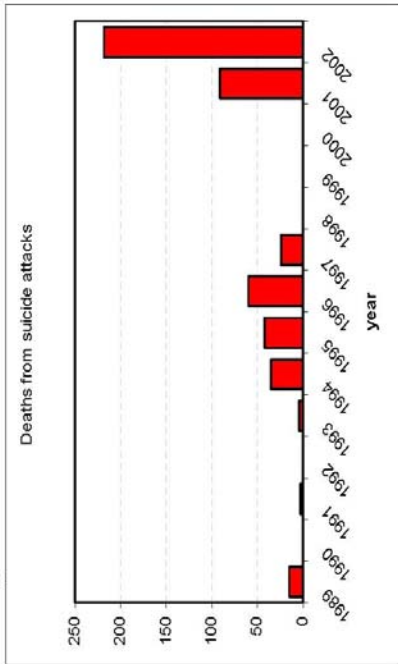


Figure 4

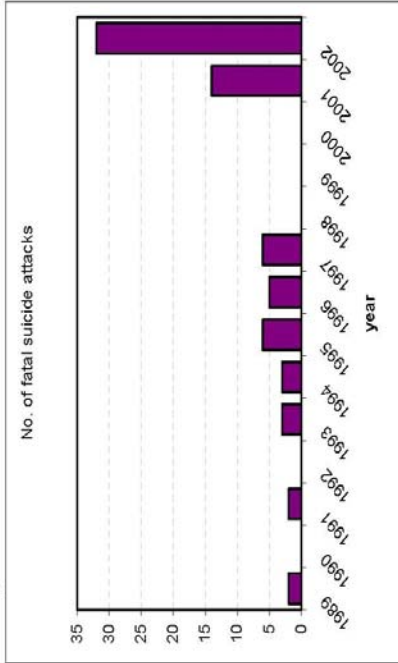
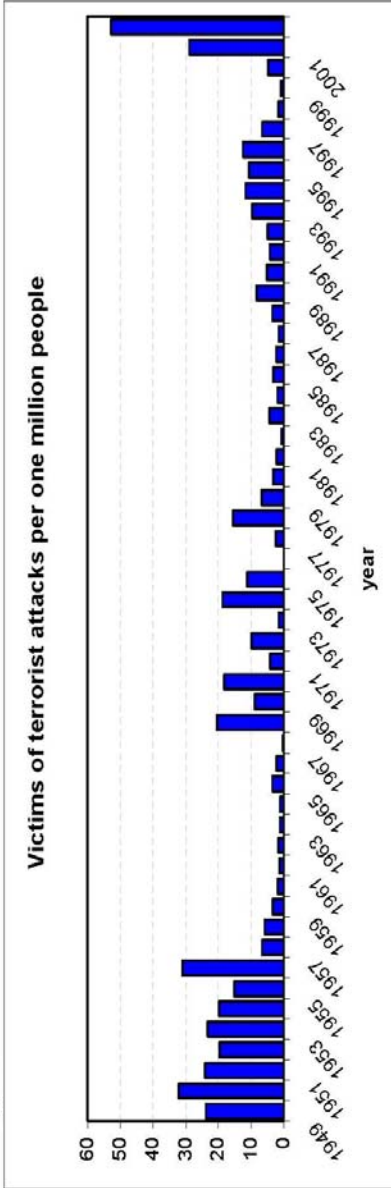


Figure 5



**Table 10 -**

	Deaths from terrorist attacks since 1949	Number of fatal terrorist attacks since 1949	Deaths from suicide attacks since 1949	Number of fatal suicide attacks since 1949
Daily Average	0.094	0.045	0.026	0.004
Daily STD	0.832	0.226	0.615	0.068
Daily Max	33	3	29	3
Daily Min	0	0	0	0
Weekly** Average	0.658	0.313	0.182	0.027
Weekly** STD	2.461	0.710	1.746	0.200
Weekly** Max	41	8	32	3
Weekly** Min	0	0	0	0
Monthly Average	2.861	1.361	0.794	0.116
Monthly STD	7.222	2.084	4.958	0.569
Monthly Max	112	23	79	8
Monthly Min	0	0	0	0
Yearly* Average	33.907	16.259	9.111	1.352
Yearly* STD	53.120	17.165	33.290	4.845
Yearly* Median	24	11	0	0
Yearly* Mode	3	3	0	0
Yearly* Max	351	89	218	32
Yearly* Min	0	0	0	0
<b>TOTAL</b>	<b>1857</b>	<b>883</b>	<b>515</b>	<b>75</b>

\* ends with 2002, \*\* weeks start on Sunday and end on Saturday

Appendix B

Table 11

Educational Distribution of Palestinian Population Age 18 or older in the West Bank and Gaza Strip as obtained from the Palestinian Center for Policy & Survey Research, between 19-24 December 2001.

<i>Other/DK</i>	12	1%
<i>Illiterate</i>	162	12%
<i>Elementary</i>	251	18%
<i>Preparatory</i>	347	26%
<i>Secondary</i>	368	27%
<i>College</i>	111	8%
<i>BA</i>	101	7%
<i>MA+</i>	5	0%
No. of obs..	1,357	

Table 12

Educational Distribution of Palestinian Population Age 15-56 Males and Muslims as obtained from the 1993 "Labor Force Surveys in Judea, Samaria and Gaza"

<i>Other</i>	42	0%
<i>Primary</i>	8,509	21%
<i>Intermediate</i>	11,332	28%
<i>Secondary</i>	14,135	35%
<i>Vocational</i>	427	1%
<i>Post Secondary</i>	2,596	6%
<i>Academic institute</i>	3,237	8%
No. of obs.	40,278	

Figure 6

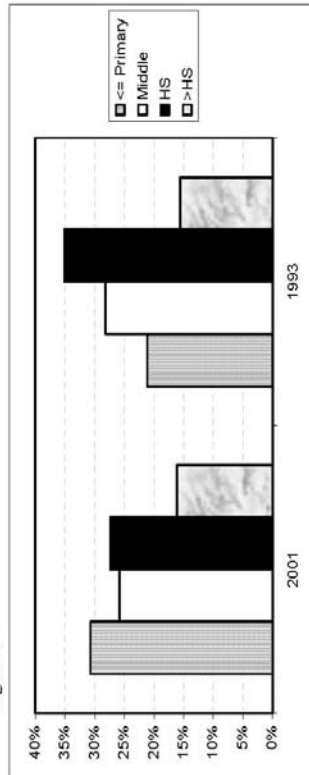
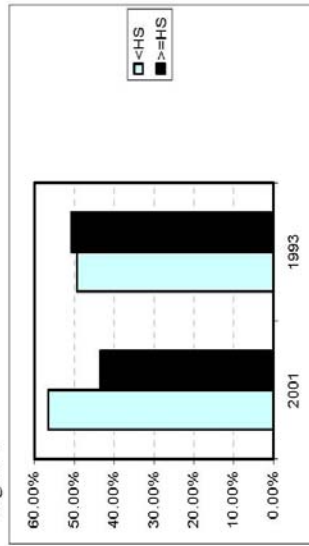
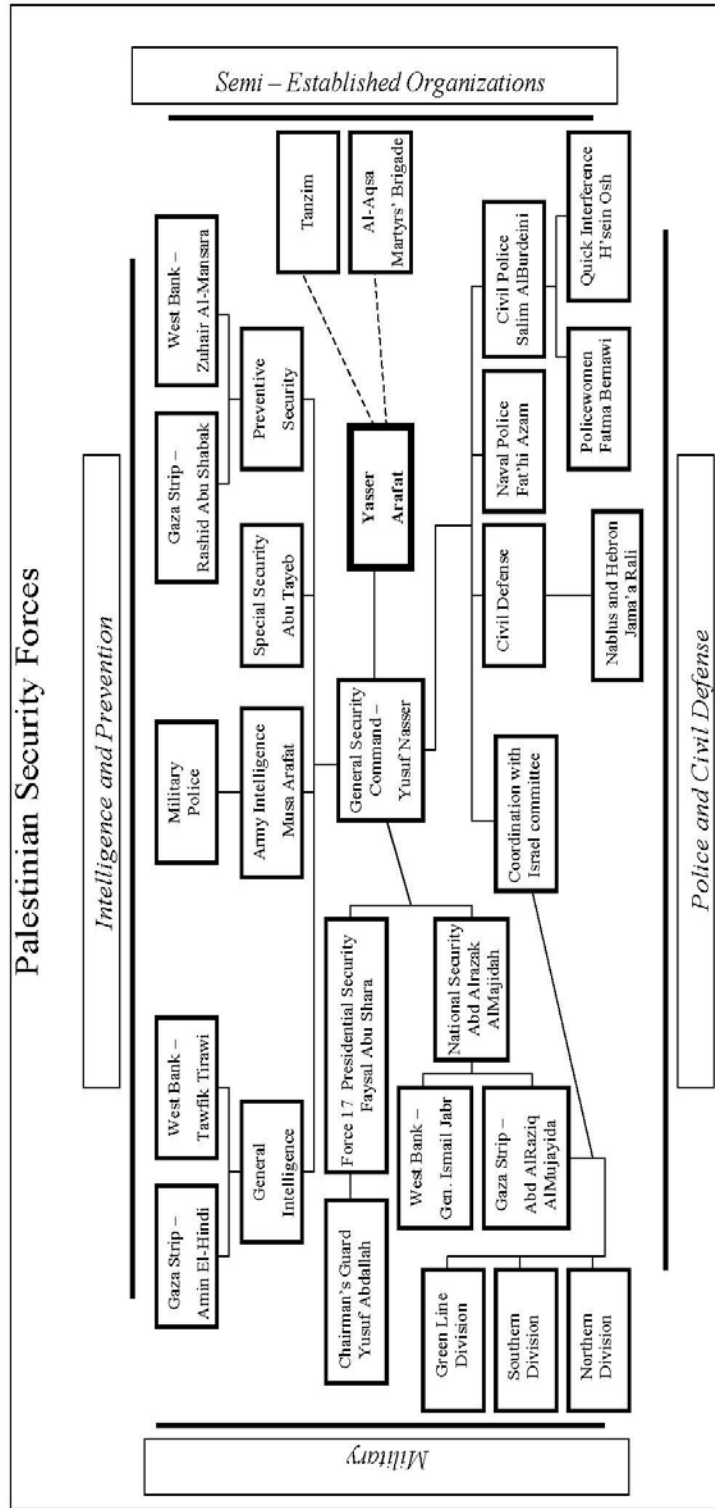


Figure 7



# Appendix C

Figure 8



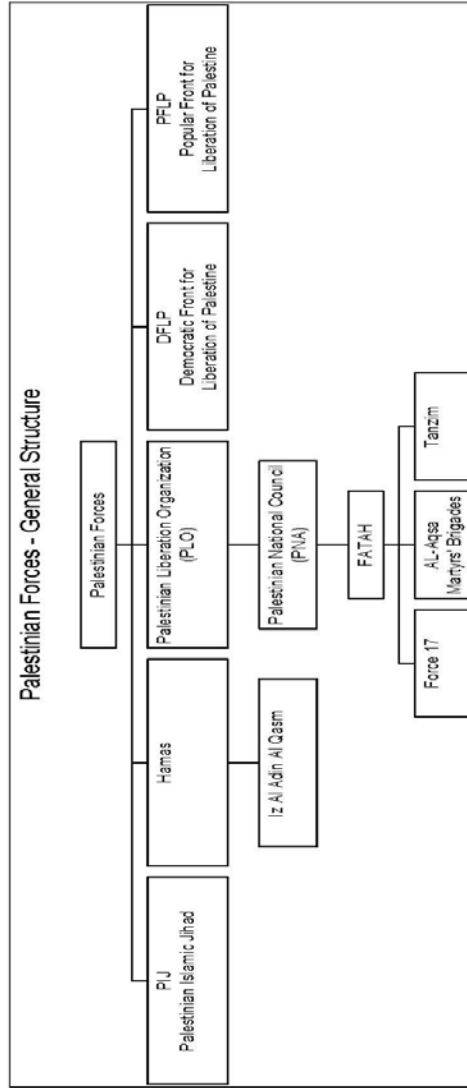
Information based on Ha'aretz internet special edition from June 8, 2001, and additional information collected since\*

Free translation of the title is: "The opposing army" by Avrahami Avner. The figure was updated whenever I came across reliable information on current postings.  
 תרגום חופשי של התואר "הצבא המפגע" מאת אברהמי אבנר



Appendix D

Figure 9



## Chapter 2

# On Terrorism and Electoral Outcomes: Theory and Evidence from the Israeli-Palestinian Conflict\*

Claude Berrebi<sup>†</sup> and Esteban F. Klor<sup>‡</sup>

---

\* We are grateful to Michael Beenstock, Hugo Hopenhayn, Jeffrey Kling, Cecilia Rouse, Klaas Staal, Eyal Winter and especially to Alan Krueger, Christopher Sims and Solomon Polachek for very helpful discussions. The paper has benefited also from the comments of audiences at seminars and conferences too many to mention. Yaakov Garini provided invaluable help in the construction of the data set. The first author thanks the Industrial Relations Section at Princeton University for their financial support. The second author thanks the W. Allen Wallis Institute of Political Economy at the University of Rochester for its hospitality while working on this project. All views and remaining errors are solely our own.

<sup>†</sup> Department of Economics, Princeton University, New Jersey. E-mail: [cberrebi@princeton.edu](mailto:cberrebi@princeton.edu); <http://www.princeton.edu/cberrebi>

<sup>‡</sup> Department of Economics, Hebrew University of Jerusalem, Israel. E-mail: [eklor@mscc.huji.ac.il](mailto:eklor@mscc.huji.ac.il); <http://economics.huji.ac.il/faculty/klor/klor.htm>

## Abstract

This paper investigates the interaction between terrorist attacks and electoral outcomes in Israel. We analyze a dynamic model of reputation that captures the salient characteristics of this conflict. The equilibrium of the theoretical model generates two precise empirical predictions on the interaction between terrorism and electoral outcomes. First, we expect that the relative support for the rightist party increases after periods with high levels of terrorism and decreases after relatively calm periods. Second, the expected level of terrorism is higher during the leftist party's tenure in office compared to the one expected during the rightist party's term in office. We test these hypotheses using a newly culled data set on terrorist attacks between 1990 and 2003. The first hypothesis is strongly supported by the available data obtained from public opinion polls on the Israeli electorate's intent of voting. We use event study methods and likelihood ratio tests to evaluate the second hypothesis, as electoral outcomes are endogenous to the level of terrorist attacks. The results support our theoretical prediction for three of the four Israeli governments in the studied time period. Accordingly, we observe an increase in terrorist attacks during leftist governments and a decrease in attacks during rightist governments.

Keywords: Terrorism, Electoral Outcomes.

JEL Classification: D7, N4.

## 1. Introduction

Three hundred and ninety terrorist attacks resulted in more than a thousand Israeli fatalities between November 1991 (when the Madrid Peace Conference formally initiated the peace process) and October 15, 2003. Despite its large toll in human lives, the Israeli-Palestinian conflict is not characterized by continuous and uninterrupted violence. Rather this conflict exhibits marked fluctuation between periods of relative calm followed by bloody cycles of violence. Nowadays this conflict is going through an extremely violent period plagued with attacks and retaliations. This latest cycle of violence that began in September 2000 was preceded, however, by three very quiet years in terms of fatalities. That quiet period, in turn, was itself preceded by a violent one which arguably began in 1994, ending the quiet years that followed the first Palestinian uprising (Intifada).<sup>1</sup>

The number of fatalities is not the only variable that exhibits a cyclical behavior since the beginning of the peace process. The Israeli Prime Minister's political affiliation seems to change from the right wing party to the left wing party, and conversely, every time the office is up for grabs. In the studied period, the Likud government led by Shamir was replaced in 1992 by the Labor government led by Rabin. This Labor government, in turn, was replaced by the Likud government of

---

<sup>1</sup>A description of our data set, containing a precise definition of terrorist attacks and fatalities, appears in Subsection (4.1). Figure 1 depicts the monthly number of fatalities among Israeli citizens in the studied time period.

Benjamin Netanyahu in 1996, which lost the 1999 elections against Ehud Barak of the Labor party. Finally, Barak was defeated in 2001 by Ariel Sharon from the Likud party. While the possibility that the level of terrorism might influence electoral outcomes was already mentioned in the Israeli popular press (*Yediot Aharonot*, January 10, 2003), the previous description of events suggests that electoral outcomes influence the level of terrorism as well, thereby creating an interaction between the two variables.

This paper investigates theoretically and empirically the dynamic interaction between voters and terrorist groups focusing on the Israeli-Palestinian conflict. This conflict is especially suited to conduct such a study for a number of reasons. Occupation and terrorism are the most salient issues in this country. Democratic elections occur periodically and political parties' positions with respect to the occupied territories are fairly well known to voters and terrorists alike. Consequently, any empirical relation between terrorism and electoral outcomes is likely to be evident in this case study.

We analyze a dynamic model of reputation that captures the salient characteristics of this conflict. In particular, we develop a game where nature chooses at the outset the identity of the Palestinian organization responsible for terrorist attacks. We differentiate between two types of Palestinian organizations. The main objective of one of the organizations is the establishment of a sovereign Palestinian state in the West Bank and Gaza Strip, part of the territories occupied by Israel in the 1967 Arab-Israeli war. We identify this group with the Palestinian Authority (henceforth PA). The second organization's main goal is the establishment

of a sovereign Palestinian state according to British Mandate Palestine's borders; that is, including the occupied territories as well as Israel. We identify this group with Hamas. For the purposes of our model, the difference between these groups is that the PA behaves strategically and engages in costly terrorist activity only to the extent that this might induce Israel to emancipate the occupied territories. Hamas, on the contrary, maximizes the expected level of terrorist activity against Israel, irrespective of whether or not emancipation is granted.

At any given period the sequence of events is as follows. First, the PA chooses whether or not to aggressively suppress Palestinian terrorists. In practice, the PA can implement policies designed to thwart terrorism as confiscating illegal weapons, actively chasing after and incarcerating terrorists as well as dismantling the terrorist infrastructure. Choosing not to suppress terrorists entails a cost for the PA. After observing the PA's choice, Israeli voters elect a party to hold office. Israelis don't know whether the PA or Hamas is responsible for the terrorist attacks.<sup>2</sup> Israelis value occupation but suffer a utility cost from terrorism. There are only two parties running for office, left and right. The only difference between these two parties is that the transition probability from occupation to emancipation is greater for a leftist government. Hence, Israelis vote for the left party only if at that particular point in time their utility from granting emancipation is greater than their utility from

---

<sup>2</sup>Although Hamas tends to publicly assume responsibility when any of its members commits an attack, Israelis may not know whether the PA was able or not to stop the attack. For the purposes of this paper we say that the PA is responsible for an attack if it is able to stop it but unwilling to do so.

continuing the occupation. After observing the Israelis' move, the Palestinian organization carrying out the terrorist attacks chooses a level of effort in pursuit of such attacks. The actual level of terrorism is a random variable, the expected value of which depends on the exerted level of effort and the PA's self-policing choice. At the end of each period there are two nature moves. First, the realization of a random variable (whose distribution depends on the elected Israeli government) determines next period's political state: either occupation or emancipation. Emancipation is an absorbing state, once granted it cannot be taken away. Second, the level of terrorism is realized. Israelis and Palestinians observe these realizations and update their beliefs according to Bayes rule.

The main theoretical result shows that in the unique pure strategies Markov perfect equilibrium of the game, if Israelis believe with high probability that they are facing Hamas, then the PA tries to separate itself by suppressing terrorism and exerting low effort at the last stage of every period. When enough separation is achieved, if the territories are still occupied the PA chooses not to combat terrorism, thereby increasing the expected level of attacks. By promoting an increase in the level of terrorism the PA seeks to impose costs on the Israelis to force them to grant emancipation. In equilibrium, Israelis always vote for the rightist party if they believe with high probability that Hamas is the group perpetrating the terrorist attacks. If instead Israelis believe that the PA is behind the attacks, they vote for the leftist party only when the PA accommodates terrorists, whereas Israelis vote for the rightist party if the PA clamps down on terrorists.

The intuition behind the equilibrium strategies is as follows. When Israelis

believe with high probability that Hamas is behind the attacks, they expect a high level of terrorism, whether emancipation is granted or not. Therefore, Israelis, who obtain a benefit from occupation, vote for the rightist party. In this range of beliefs the PA clamps down on terrorists and doesn't exert high effort in the pursuit of terrorist attacks as it tries to differentiate itself from Hamas. That is, the PA wants to establish a reputation as a rational partner for peace. Once such a reputation is established, if the PA continued to suppress terrorism, Israelis wouldn't suffer a cost from maintaining the occupation and would thereby try to perpetuate it. This is precisely the reason that drives the PA to accommodate terrorism: to impose costs on the Israelis in order to force them to grant emancipation. Israelis expect that maintaining the occupation will lead to a stream of high-level terrorist attacks, not because they are facing Hamas, but rather because the PA is not suppressing terrorism. Given that the PA's optimal strategy is to suppress terrorism once emancipation is granted, Israelis vote for the leftist party in this range of beliefs after observing that the PA accommodates terrorism.

Our analysis thus emphasizes that terrorism is mainly used to impose costs on the Israelis to force them to grant emancipation. Although current costs can be substantial, it is the expectation of high levels of terrorism in the future that convinces the Israeli electorate that it is not worth maintaining the occupation. This provides a formalization of Pape's (2003) arguments. In addition to those arguments, our model also provides an explanation for relative calm periods. In those periods the PA is trying to signal to the Israeli electorate that it is able to lower the level of terrorism. Such a signal is important for the PA because the Israeli



electorate has no incentives to end the occupation if it believes that terror won't stop once emancipation is granted.

The equilibrium of the theoretical model generates two precise empirical predictions on the interaction between terrorism and electoral outcomes. First, we expect that the relative support for the rightist party increases after periods with high levels of terrorism and decreases after periods of relative calm. Second, perhaps paradoxically, the model predicts that the expected level of terrorism is higher during the leftist party's tenure in office compared to the expected level of terrorism during the rightist party's tenure in office. Note that this prediction follows from the Palestinians' strategic considerations and not from different deterrence policies that could be implemented by the Israeli government.<sup>3</sup>

Kydd and Walter (2002) and Bueno de Mesquita (2004) also focus on the Israeli-Palestinian conflict, developing alternative explanations for the observed fluctuations on the level of terrorism. In the framework of Kydd and Walter (2002) extremists engage in terrorism to stop the implementation of a peace treaty. Accordingly, we should expect a significant short-term increase in the level of terrorism only during a peace process. Bueno de Mesquita (2004) develops a

---

<sup>3</sup>In this respect our empirical analysis is significantly different from most empirical studies of terrorism. In general, empirical studies of terrorism assume that terrorists' utilities are increasing in the level of attacks and that the observed fluctuations are a consequence of the implementation of different deterrence policies (Enders and Sandler, 1993 and 2002; Brophy-Baermann and Conybeare, 1994).

complementary framework whereby only moderate terrorist organizations accept the concessions granted by the government, leaving extremists in control of the violent opposition. This accounts for an increase in the militancy of organizations engaged in terrorist activity and, conditional on the failure of counter terrorism, to a longer-term increase in terrorist attacks.<sup>4</sup>

While we focus on the same case study, we view our approach as complementary to the ones outlined above. Following the implications of the theoretical model our empirical estimation concentrates only on periods that precede Israeli elections, studying the interaction between the level of terrorism and electoral outcomes to explain the striking variability in the level of terrorism that preceded different Israeli elections. Accordingly, the PA's optimal level of terrorism before an Israeli election varies depending on the identity of the political party currently holding office in Israel; we should observe a higher level of terrorism before elections when the Labor party is holding office relative to the expected level of terrorism when the Likud party is holding office. Moreover, our paper also studies the effects of terrorism on the political preferences of the Israeli electorate, a topic not directly covered by the two analyses mentioned above.

We test the hypotheses derived in our theoretical model using a newly culled data set on terrorism in Israel and the occupied territories between 1990 and 2003. The first hypothesis is strongly supported by the available data obtained from public opinion polls on the Israeli electorate's intent of voting. Accordingly, a temporary

---

<sup>4</sup>A thorough comparison of the two approaches appears in Bueno de Mesquita (2003).

marginal increase in the number of fatalities from terrorist attacks causes an increase in the support for the rightist party of 0.4 percent, evaluated at the averages. The results are not affected when we control for the identity of the party holding office. Whether the Prime Minister at the time of the attacks belongs to the rightist party has no effect on that party's relative support either.

To determine the validity of the second hypothesis we use a combination of event study methods together with likelihood ratio tests. The main results support our theoretical prediction for three of the four Israeli governments in the studied time period. Accordingly, we observe a statistically significant increase in the level of terrorism during the leftist party term in government and a statistically significant decrease in terrorism during the rightist party term in government. The unity coalition government led by Ariel Sharon between March 2001 and February 2003 is the only government that exhibits a pattern of terrorism that contradicts our analytical results. Given that this government was out of the ordinary for several reasons, we are confident that the obtained results strongly support our theoretical predictions.<sup>5</sup>

At a first glance, the picture that emerges from our empirical results could lead us to alternative theoretical explanations. A model that focuses on terrorism-

---

<sup>5</sup>The coalition government formed between 2001 and 2003 is a difficult government to characterize. In this period, although the prime minister belonged to the rightist party, the leftist party was not only an active partner in the ruling coalition, but also was the party with the largest representation in the Israeli parliament.

deterrence policies, for example, could in principle fit the obtained empirical patterns. Accordingly, terrorist groups want to maximize the number of terrorist attacks irrespective of the reigning political environment in Israel. We observe a lower number of attacks when the right wing party is holding office simply because this party implements tougher antiterrorism policies. It would be natural then to expect that the electorate's preferences shift rightward during periods with high levels of terrorism.

That deterrence policies have an effect on terrorism fluctuations is an empirical fact (Enders and Sandler, 1993 and 2002; Brophy-Baermann and Conybeare, 1994). The surprising findings in our case study are, however, that left wing governments are much more aggressive than right wing governments in the implementation of deterrence policies during the analyzed time period - the same time period where we observe a significantly higher number of attacks against left wing incumbents. Available data on the relative frequency of closures show that the average number of days where a total closure was imposed on the West Bank and Gaza Strip is 0.44 and 0.78 for the left wing governments of Peres and Barak respectively. These figures decrease significantly for the right wing governments in the studied time period: 0.05 for Netanyahu's government and 0 for the first government of Sharon.

We do not dispute that the existing notion among some Israeli voters that the right wing party is tougher on terrorism may play a role on their preferences towards the different political parties. The evidence provided above, however, casts serious doubts that the deterrence policy hypothesis can account, by itself, for the observed fluctuations on the level of terrorism. Overall, thus, the obtained evidence leads us

to conclude that indeed there exists an empirical interaction between terrorist attacks and electoral outcomes along the lines described in the theoretical model at hand.

## 2. The Theoretical Model

This section develops our theoretical model of territorial occupation, terrorism and emancipation.

### 2.1. Preliminaries

We consider an infinite horizon economy with two types of agents. Agents are either Israeli citizens or Palestinians residing in the currently occupied territories. Palestinians are affiliated with either the Palestinian Authority or Hamas. We treat all the agents of a given group as identical. Both Palestinian groups share as their goal the establishment of an independent Palestinian State. The PA reclaims a retreat to pre-1967 borders. Hamas's main objective is the establishment of an independent Islamic Palestinian state along the borders of British Mandate Palestine.<sup>6</sup>

Time is discrete:  $t = 0, 1, 2, \dots$ . A nature move selects at the outset the group responsible for terrorism.<sup>7</sup> Let  $\rho_0 \geq 0$  be the prior probability at time zero that the

---

<sup>6</sup>Article 13 of Hamas's charter, for example, states that “[Peace] initiatives, the so-called peaceful solutions, and international conferences to resolve the Palestinian problem all contradict the beliefs of the Islamic Resistance Movement. Indeed, giving up any part of Palestine is tantamount to giving up part of its religion. The nationalism of the Islamic Resistance Movement is part of its religion, and it instructs its members to [adhere] to that and to raise the banner of Allah over their homeland as they wage their Jihad.” (Mishal and Sela, 200, pp. 183).

<sup>7</sup>Assuming, along the lines of Mailath and Samuelson (2001), that there exists a small positive probability that the Palestinian group in control of terrorism might change from one period to the next does not affect the model's results.

PA is selected as the group carrying on the terrorist attacks. The sequence of events within a period is as follows. At the end of every period a given level of terrorism is realized. Israelis don't know for certain which group is responsible for the terrorist attacks. Given a history of attacks, at the beginning of period  $t$  Israelis assign a probability  $\rho_t$  to the PA being the group choosing the effort level exerted in terrorism. The PA then decides whether or not to attempt to suppress terrorists. We denote this decision by  $k$ ; when  $k = 0$  the PA clamps down on terrorists and when  $k = 1$  the PA accommodates terrorists. Choosing not to suppress terrorists entails a cost of  $c > 0$  for the PA.<sup>8</sup> After observing the PA's decision as well as the entire history of play up to the current period, Israelis elect a government  $g \in \{r, l\}$ . The transition probability from occupation to emancipation under a leftist government,  $\Pr(em | oc, g = l)$ , is assumed greater than under a rightist government,  $\Pr(em | oc, g = r)$ . To simplify notation we denote  $\Pr(em | oc, g)$  as  $p_g$ .

After an Israeli government has been elected, the Palestinian organization perpetrating the terrorist attacks chooses a level of effort,  $e \in \{\underline{e}, \bar{e}\}$ , in pursuit of such attacks. The Israeli electorate only observes the realized level of terrorism but not the effort level chosen in the pursuit of attacks, nor the identity of the group choosing  $e$ . If the PA decided to attempt to clamp down on terrorist activity, low

---

<sup>8</sup>This can be understood first as a reputation cost. This reputation cost leads in several instances to economic costs as foreign countries and international organizations are reluctant to financially support a regime tied to terrorist activity. Another interpretation might stress the inherent risk that the PA's government faces for not instituting the rule of law. Accordingly, the existence of several armed factions residing in the territory under the PA's control is a clear source of political instability.

effort yields a low level of terrorism,  $\tau_l$ , with probability  $\alpha \in (1/2, 1)$ . With probability  $1 - \alpha$  low effort results in  $\tau_h$ . Conversely, high effort yields a low level of attacks with probability  $1 - \alpha$ , and a high level of attacks with probability  $\alpha$ . When the PA does not suppress terrorism it influences the outcome distribution of terrorist attacks. In particular, if the PA chooses to accommodate terrorism,  $\Pr(\tau_l | \underline{e}, k = 1) = \gamma \in (1 - \alpha, \alpha)$  and  $\Pr(\tau_h | \underline{e}, k = 1) = 1 - \gamma$ .<sup>9</sup> At the end of each period the political state is realized. Emancipation is an absorbing state: once granted it cannot be rescinded, so the previously occupied territories remain a sovereign country in the future.<sup>10</sup> Israelis and Palestinians next observe the realized level of terrorism and update their beliefs about the identity of the group responsible for the attacks. All the players discount the future using the same discount factor  $\beta \in (0, 1)$ .

In every period the Israelis' preferences are represented by a standard von Neumann-Morgenstern utility function  $u^I : \{oc, em\} \times \{\tau_l, \tau_h\} \mapsto \mathbf{R}$ , where  $oc$  is applicable when the territories are under Israeli occupation and  $em$  is applicable otherwise, and  $\{\tau_l, \tau_h\}$  is the set of feasible terrorist attacks by the Palestinians, with  $\tau_l < \tau_h$ . We posit that given a level of terrorism Israelis benefit from continuing the

---

<sup>9</sup>Assuming that not suppressing terrorist activity also raises the expected number of attacks when high effort is exerted would not change any of the results of the paper, as long as the expected level of terrorism when low effort is exerted is always lower than under high effort.

<sup>10</sup>This is not to deny that a territory can be reoccupied. Nevertheless, once emancipation is granted and a new nation is formed, it could be extremely costly to reoccupy it.



occupation (i.e.,  $u^l(oc, \tau) > u^l(em, \tau)$  for  $\tau = \tau_l, \tau_h$ ), and that utility is decreasing in the level of attacks (i.e.,  $u^l(y, \tau_l) > u^l(y, \tau_h)$ ,  $y = oc, em$ ).

The instantaneous preferences of the PA are represented by  $w^{PA} : \{oc, em\} \times \{e, \bar{e}\} \times \{0, 1\} \mapsto \mathbf{R}$  defined by  $w^{PA}(y, e, k) := w(y, e) - kc$ , where  $e$  reflects the PA's exerted level of effort, and  $k$  is equal to 0 when the PA decides to attempt to suppress terrorism and is equal to 1 otherwise.<sup>11</sup> We assume that for a given level of  $e$  and  $k$  the PA prefers a state of emancipation to occupation (i.e.,  $w^{PA}(em, e, k) > w^{PA}(oc, e, k)$ ), and that effort is costly; that is, for a given political state and decision on whether or not to suppress terrorism the PA prefers to exert low effort rather than high effort (i.e.,  $w^{PA}(y, e, k) > w^{PA}(y, \bar{e}, k)$ ). Hamas's payoffs are not defined as it always exerts high effort.

Several clarifications are in order here. In reality, Hamas is a complex organization. Like other social and political movements, Hamas has clearly stated goals and employs strategic decision-making in pursuit of those objectives. Even if one of the central goals stated in Hamas's Charter is the liberation of historic Palestine through holy war against Israel and establishing an Islamic state on its soil, the group might adapt its behavior according to the existing political realities. What counts for the purposes of this paper, however, is not Hamas's essence as a movement but the Israeli electorate's perception of Hamas. In that respect, our

---

<sup>11</sup>In order to avoid introducing more notation, we restrict  $w(y, e)$  to  $w(y)$  when nature selects Hamas, and not the PA, to exert effort level in the pursuit of attacks.

assumption reflects the prevailing image of Hamas among the Israeli electorate as an ideologically intransigent and politically rigid movement, ready to pursue the destruction of Israel at any cost, with no limits or constraints.<sup>12</sup>

Contrary to Hamas, the PA adopted a two-state solution approach to the conflict –Israel within its 1967 borders and an independent Palestinian state in the West Bank and Gaza Strip. The divergence between Hamas and the PA regarding ultimate objectives and means is the source of their peculiar relationship of coexistence. At times, their interests collide and the PA implicitly grants Hamas operational freedom in the pursuit of terrorist activity. In other occasions the PA determines that terrorist attacks might undermine its goals, prompting the PA to take measures against Hamas and its members (Kimmerling and Migdal, 2003).

The next subsection solves for the unique pure strategy Markov Perfect Equilibrium of this game.

## **2.2. Equilibrium Characterization**

In this section we characterize the unique pure strategy Markov Perfect Equilibrium of this game in which strategies depend only on the current state of the game.

In the presence of uncertainty concerning the Palestinians' type, the state of the system at period  $t$  consists of the Israelis' posterior probability that the PA is

---

<sup>12</sup>Hroub (2000) and Mishal and Sela (2000) develop a thorough study of Hamas. See Kydd and Walter (2002) for a rational choice study of terrorism in which the radical group adopts a nontrivial strategy.

responsible for terrorism together with the political state of the territories. The set of possible states is  $S = \{(y, \rho) : y \in \{em, oc\} \text{ and } \rho \in [0,1]\}$ . A Markov strategy for the PA, denoted by  $\sigma^{PA} : S \times \{l, r\} \mapsto \{0,1\} \times \{\underline{e}, \bar{e}\}$ , is a function of the state  $S$  and the government elected by the Israelis in the current period. This strategy determines whether the PA accommodates or attempts to suppress terrorism and what level of effort exerts on terrorist activities after the elections in Israel. Israelis' Markov strategy, denoted by  $\sigma^I : S \times \{0, 1\} \mapsto \{l, r\}$ , is a function of the state variable as well as of the PA's self-policing decision. This mapping determines the current period's chosen political party in Israel. Hamas has a trivial strategy, as it makes no choices.

Given a realized level of terrorism  $\tau \in \{\tau_l, \tau_h\}$  and prior beliefs  $\rho$ , let  $\varphi(\rho | k, \tau)$  denote the Israelis' posterior beliefs that the PA is carrying the terrorist attacks conditional on the PA's strategy. A pure strategy Markov Perfect equilibrium is a tuple  $\{\widehat{\sigma}^{PA}(S | g), \widehat{\sigma}^I(S | k), \varphi(\rho | \tau, k)\}$ , such that  $\widehat{\sigma}^{PA}$  and  $\widehat{\sigma}^I$  are best-responses to each other for all  $S$ , and Israelis use Bayes rule to update their posterior probabilities. Formally, denote by  $w^{PA}(\widehat{\sigma}^I(S | k), \sigma^{PA}, S)$  the instantaneous utility of the PA as a function of the state  $S$  and the players' Markov strategies; define the Israelis' expected instantaneous utility by

$$U^I(\sigma^I, \widehat{\sigma}^{PA}(S | g), S) := \Pr(\tau_l | \sigma^I, \widehat{\sigma}^{PA}(S | g), S)u^I(y, \tau_l) + \Pr(\tau_h | \sigma^I, \widehat{\sigma}^{PA}(S | g), S)u^I(y, \tau_h);$$

and let  $p_g(\sigma^I, \sigma^{PA}, S)$  denote the transition probability from state  $S$  to state  $(em, \rho')$  as a function of the strategies  $\sigma^I$  and  $\sigma^{PA}$ . The resulting Bellman equation for every player is thus:

$$V^{PA}(S) = \max_{\sigma^{PA}} \{w^{PA}(\widehat{\sigma}^I(S|k), \sigma^{PA}) + \beta[p_g(\widehat{\sigma}^I(S|k), \sigma^{PA}, S)V^{PA}(em, \rho') + (1-p_g(\widehat{\sigma}^I(S|k), \sigma^{PA}, S))V^{PA}(oc, \rho')]\} \quad (2.1)$$

and

$$V^I(S) = \max_{\sigma^I} \{U^I(\sigma^I, \widehat{\sigma}^{PA}(S|g), S) + \beta[p_g(\sigma^I, \widehat{\sigma}^{PA}(S|g), S)V^I(em, \rho') + (1-p_g(\sigma^I, \widehat{\sigma}^{PA}(S|g), S))V^I(oc, \rho')]\}. \quad (2.2)$$

A pure strategy Markov perfect equilibrium is a strategy combination together with posterior beliefs such that  $\widehat{\sigma}^{PA}$  solves (2.1),  $\widehat{\sigma}^I$  solves (2.2) and the posterior beliefs are updated as follows. If the PA exerts high effort, then  $\varphi(\rho|\tau, k) = \rho$ .

Alternatively, when the PA strategy is such that  $\widehat{\sigma}^{PA}(S|g) = (k, \underline{e})$ ,

$$\varphi(\rho|k, \tau_l) = \begin{cases} \frac{\rho\alpha}{\rho\alpha + (1-\rho)(1-\alpha)} & \text{for } k = 0, \\ \frac{\rho\gamma}{\rho\gamma + (1-\rho)(1-\alpha)} & \text{for } k = 1, \end{cases}$$

and

$$\varphi(\rho|k, \tau_h) = \begin{cases} \frac{\rho(1-\alpha)}{\rho(1-\alpha) + (1-\rho)\alpha} & \text{for } k = 0, \\ \frac{\rho(1-\gamma)}{\rho(1-\gamma) + (1-\rho)\alpha} & \text{for } k = 1. \end{cases}$$

We can characterize the unique pure strategy Markov perfect equilibrium by exploiting several features of the model. Note first that for any  $S$  the PA chooses  $e = \underline{e}$ . Behaving differently is simply more costly and cannot influence, in equilibrium, the Israelis' posterior beliefs.<sup>13</sup> Hence, the continuation value (the

---

<sup>13</sup>More precisely, if in any period the PA were to choose high effort, then Israelis would not adjust their posterior in response to the signal in that period, and so the PA would optimally choose low effort, disrupting the equilibrium.

discounted expected net present value) for the PA after emancipation is realized is

$$V^{PA}(em, \rho) = \frac{w^{PA}(em, 0, \underline{e})}{1 - \beta},$$

since  $w^{PA}(em, 0, \underline{e}) > w^{PA}(em, 1, \underline{e})$ . That is,  $\widehat{\sigma}^{PA}((em, \rho) | g) = (0, \underline{e})$  for any  $\rho$  and  $g$ .

Given  $\widehat{\sigma}^{PA}$ , the Israelis' continuation value after emancipation is realized is

$$V^I(em, \rho) = \frac{u^I(em, \tau_l)[\rho\alpha + (1 - \rho)(1 - \alpha)] + u^I(em, \tau_h)[\rho(1 - \alpha) + (1 - \rho)\alpha]}{1 - \beta},$$

which is monotonically increasing in  $\rho$ .

In what follows we impose the following two restrictions:

$$\gamma < \frac{[u^I(em, \tau_l) - u^I(em, \tau_h)]\alpha - [u^I(oc, \tau_h) - u^I(em, \tau_h)]}{u^I(oc, \tau_l) - u^I(oc, \tau_h)}, \quad (2.3)$$

and

$$u^I(em, \tau_l) - u^I(oc, \tau_h) > [u^I(oc, \tau_l) - u^I(em, \tau_h)] \frac{(1 - \alpha)}{\alpha}. \quad (2.4)$$

The first inequality imposes an upper bound on  $\gamma$ , the parameter that characterizes the expected level of terrorist attacks when the PA decides not to stop terrorism. This condition ensures that the increase in expected terrorist attacks when the PA accommodates terrorism is significant enough such that to try to maintain the occupation of the territories is no longer a dominant strategy for the Israelis

irrespective of their beliefs.<sup>14</sup> The second inequality is a technical requirement that guarantees that the range of  $\gamma$  is not empty.<sup>15</sup>

Given the stated assumptions, in a state of occupation, contrary to the analysis above, the PA's optimal strategy depends on the Israelis' strategy. Clearly, in equilibrium Israelis elect a left wing government whenever the continuation value from emancipation is greater than the continuation value of maintaining the occupation; that is, whenever  $V^l(em, \rho) > V^l(oc, \rho)$ . Otherwise, Israelis elect a right wing government. Given the Israelis' behavior and beliefs, the PA might find it profitable in certain states to accommodate terrorism to lower the value that Israelis accrue from maintaining the occupation. In particular, note that if the PA clamps down on terrorists  $V^l(em, \rho) < V^l(oc, \rho)$  for every  $\rho$ , implying that  $\widehat{\sigma}^l((oc, \rho) | k = 0) = r$ . For a certain range of  $\rho$ , however, if the PA does not suppress terrorism whenever the territories are occupied

---

<sup>14</sup>Note that if this condition is not satisfied the PA always suppresses terrorism. In a more general framework where the PA can choose the level of self-policing (i.e., this is not a dichotomous decision), condition () is always satisfied endogenously. Otherwise the PA wouldn't be able to threat Israelis with cooperation with terrorist organizations, and occupation is always maintained.

<sup>15</sup>This condition is not very restrictive either. As an example, if we assume that  $u^l(y, \tau) = f(y) \times (\tau_h - \tau)$ , where  $f(em)$  is equal to a constant  $a > 0$  and  $f(oc)$  is equal to a constant  $b > a$ , the second inequality is satisfied whenever  $\frac{a}{b} > \frac{1-a}{\alpha}$ ; that is, when the benefits from continuing the occupation for a given level of terrorist attacks does not significantly exceed the benefits from granting emancipation.

$V^I(em, \rho | k = 0) > V^I(oc, \rho | k = 1)$ ; that is, the PA accommodates terrorism to induce the Israelis to favor emancipation.<sup>16</sup>

For such a strategy to be effective there has to be sufficient credibility in the PA's threats not only to continue terror as long as the territories are occupied, but also to stop terror if emancipation occurs. That credibility is captured by  $\rho$ . In other words, for  $\rho$  high enough, Israelis believe that they will suffer in the future a relatively high level of terrorist attacks as long as the occupation continues. Perhaps more importantly, Israelis also believe that those terrorist attacks will stop as soon as emancipation is granted.

More specifically, there exists a unique  $\rho^* \in (0,1)$  implicitly defined by

$$V^I(em, \rho^*) = U^I(\sigma^I, (1, \underline{e}), (oc, \rho^*)) + \beta [p_g(\sigma^I, (1, \underline{e}), (oc, \rho^*))V^I(em, \rho^*) + (1 - p_g(\sigma^I, (1, \underline{e}), (oc, \rho^*)))V^I(oc, \rho^*)]$$

such that for  $\sigma^{PA}((oc, \rho) | g) = (1, \underline{e})$ ,

$$V^I(em, \rho) \begin{cases} < V^I(oc, \rho), & \text{for } \rho < \rho^* , \\ > V^I(oc, \rho), & \text{for } \rho > \rho^* . \end{cases}$$

Accommodating terrorism is costly. Therefore, the PA does not accommodate terrorism unless that action has an effect on the Israelis' strategy. Since  $\widehat{\sigma}^I((oc, \rho) | k) = r$  for  $\rho < \rho^*$  irrespective of  $k$ , then  $\widehat{\sigma}^{PA}((oc, \rho) | g) = (0, \underline{e})$  in that

---

<sup>16</sup>Several researchers posit that this is indeed the main strategy used by terrorists. This behavior is in accordance with Oots (1986), who argues that terrorists use this strategy as an exchange medium for concessions.

range of beliefs. Although accommodating terrorism influences the Israelis to vote for the leftist party when  $\rho > \rho^*$ , such an action is not always profitable for the PA. The PA accommodates terrorism in this range of beliefs when its cost satisfies the constraint below:

$$c \leq \beta(p_l - p_r) \left[ \frac{w^{PA}(em, 0, \underline{e})}{1 - \beta} - V^{PA}(oc, \rho) \right]; \quad (2.5)$$

that is, the PA does not suppress terrorists whenever  $c$  is less than the benefits of accommodating terrorists. These benefits are a function of the probability of obtaining emancipation under the different political parties and the increase in the PA's value of emancipation relative to occupation. That is, the higher the value of emancipation relative to occupation, the more likely is condition (2.5) to be satisfied, thereby giving the PA an incentive to accommodate terrorism.<sup>17</sup>

The proposition below summarizes our characterization of the unique pure strategy Markov perfect equilibrium of the game.

**Proposition 1.** *Suppose that conditions (2.3), (2.4) and (2.5) hold. There exists a unique pure strategy Markov perfect equilibrium such that, if the territories are under Israeli occupation:*

1. *For  $\rho < \rho^*$  the PA suppresses terrorism and never exerts a high effort in the*

---

<sup>17</sup>Note that the PA accommodates terrorists even if Hamas is responsible for the terrorist attacks. Hence the decision whether to suppress or accommodate terrorism does not reveal the identity of the group responsible for terrorist attacks.



*pursuit of terrorist attacks. Israelis elect the rightist party to hold office irrespective of the PA self-policing decision.*

*2. For  $\rho \geq \rho^*$ , the PA accommodates terrorism but exerts low effort in the pursuit of terrorist attacks. Israelis elect the leftist party to hold office whenever the PA accommodates terrorism, whereas they elect the rightist party to hold office when the PA clamps down on terrorism.*

*If the territories were emancipated in the past, the PA suppress terrorism and exerts low effort in the pursuit of terrorist activity and Israelis elect either the rightist or the leftist party to hold office, irrespective of the PA's self-policing decision.*

*In every case beliefs are updated according to Bayes rule.*

There are two precise empirical implications to be drawn from Proposition 1. First, repeated realizations of a high level of terrorism increase the Israelis' beliefs that Hamas is the Palestinian organization behind the attacks. These beliefs induce the Israeli electorate to shift rightward. That is, the theoretical model predicts that the public support for the rightist party increases after periods with high levels of terrorism and decreases after relatively calm periods. Second, perhaps paradoxically, the model predicts that, while the territories are under Israeli occupation, the equilibrium expected level of terrorism is higher during a leftist party's government compared to the one expected during a rightist party's government. The reason behind this result is that Israelis elect a rightist government because they believe that there is a high probability that Hamas is behind the

terrorist attacks. Given these beliefs, the optimal strategy for the PA is to try to lower the expected level of terrorism as much as possible, choosing  $\widehat{\sigma}^{PA}(S | g) = (0, \underline{e})$ . On the contrary, when Israelis believe that the PA controls the level of terrorism, the PA accommodates terrorism in order to increase the expected level of terrorist attacks, thereby decreasing the Israelis' benefits from occupation. As continuing the occupation is no longer enticing for the Israelis given the PA's strategy, they elect for office a leftist government to increase the probability of granting emancipation.

The next section empirically assesses the validity of the two theoretical results.

### 3. Empirical Analysis

This section tests the implications of the theoretical model presented above using public opinion polls and a newly culled data set on terrorist attacks in Israel and the occupied territories between 1990 and 2003.

#### 3.1. Data

Definitions of terrorism vary widely. A certain act can be defined as a terror act in the views of one person, and at the same time be defined as a “fight for freedom” in the views of another. The particular definition of terrorist attacks that we use for the construction of our data set is the one stated by the US State Department, contained in Title 22 of the United States Code, Section 2656f(d). Accordingly,

“— The term ‘terrorism’ means premeditated, politically motivated violence perpetrated against noncombatant targets by sub national groups or clandestine agents, usually intended to influence an audience.

— The term ‘international terrorism’ means terrorism involving citizens or the territory of more than one country.

— The term ‘terrorist group’ means any group practicing, or that has significant subgroups that practice, international terrorism.”

Specifically, our data set on terrorists’ attacks contains daily information on each and every *fatal* terrorist attack against *noncombatants* that occurred on *Israeli soil* from October 31, 1990 until May 31, 2003.<sup>18</sup> Several explanations on the used

---

<sup>18</sup>Our available data expands to 1949. The reason we use data just from 1990 onwards is because our theoretical model fits only the period after the beginning of the peace process.

definition of terrorist attack are in order.

a. Fatal: Due to the collection procedure constraints, only attacks in which someone besides the terrorist died were included.

b. Noncombatants: This term is interpreted to include, in addition to civilians, military personnel who at the time of the incident are unarmed and/or not on duty.

c. Israeli Soil: This includes occupied territories when under Israeli control.

The main sources of the data are the Israeli Foreign Ministry, the National Insurance Institute, the Israeli Defense Forces and two newspapers archives (Ma'ariv and Ha'aretz).<sup>19</sup> To the best of our knowledge, this is the most accurate and comprehensive unclassified data set regarding fatal terrorist attacks against noncombatants on Israeli soil. The data are depicted in Figure 1. Summary statistics appear in Table 1.

To test the impact of terrorism on the Israeli electorate we gathered data on public opinion polls about the intent of voting of Israeli citizens. We collected all the polls published by Ma'ariv, a leading Israeli newspaper, during the studied time period. The published polls were first conducted by Gallup Israel. Later on, the polls published by Ma'ariv were conducted by Market Watch, and since November 2002 the published polls are conducted by a new polling company named New Wave. Table 2 presents summary statistics on these data.

Several potential problems with the data are worth emphasizing. First, the data on terrorist attacks only indicate attacks in which someone besides the terrorist died.

---

<sup>19</sup>See Berrebi (2003) for a detailed description of the data set and its sources.

Thus, foiled attacks as well as “unsuccessful” attacks in terms of producing fatalities are not included. Terrorist attacks outside Israeli soil were not included either. Since the just mentioned types of attacks might impact the Israeli electorate’s views we might be omitting relevant terrorist events. Second, the collected data on public opinion polls doesn’t appear on a regular basis, with a high frequency of observations before scheduled elections and long intervals without observations right after the elections. Additionally, Ma’ariv (the newspaper we extracted the data from) used several different polling companies during the studied period. This may introduce additional noise to the results as different companies may use different methods to collect and analyze the data. Finally, the persistence of individuals’ political preferences reflected in public opinion polls is likely to cause problems of serial correlation.

Besides the problems just outlined, we must pay particular attention to the electoral system in Israel. Israel has an electoral system based on nation-wide proportional representation, and the number of seats that every list receives in the Knesset (as the parliament is known) is proportional to the number of votes received. The executive branch is not elected directly but instead the president nominates a prime minister who has to obtain the support of a majority of the parliament members in a confirmation vote.<sup>20</sup> Elections are supposed to take place

---

<sup>20</sup>Beginning with the elections in 1999 the Israeli parliament introduced a system of direct elections for the prime minister in which voters voted for individual prime minister candidates separate from the vote for parties vying for seats in the parliament. Given the short and turbulent terms of the two prime ministers elected under this system, the direct elections concept was

every four years but the parliament can decide by an ordinary majority to dissolve itself and call for unscheduled early elections.<sup>21</sup> This means that the timing of elections is endogenous to the political environment. In fact, the elections for all the Knessets in the studied time period were held before the original scheduled date. In 1992, 1996, 1999 and 2001 the parliament called for early elections, whereas the elections for the sixteenth Knesset in 2003 were brought forward by the initiative of the prime minister.

The endogeneity of the electoral schedule introduces another complication to our empirical analysis. In the theoretical model the timing of events within a period is exogenous to the realization of terrorist attacks. In practice, however, we expect that the level of terrorism is not only a function of the ideology of the current government, but also of the perceived stability of that government. Palestinians may increase the level of terrorism to bring the collapse of a government that they dislike, or impose a period of relative calm to help a government that they favor. Our theoretical model does not account for these types of strategies. To solve this particular problem we restrict the part of our empirical analysis that estimates the effect of the Israeli government's ideology on the level of terrorist attacks to the period between the fall of a government and the scheduled elections for the

---

discontinued in 2001 and the previous system was restored.

<sup>21</sup>Under the direct vote for prime minister system, the prime minister, as well as the parliament, could notify the president of early elections. After the abolishment of that system, the prime minister can recommend to the president to call for early elections, but the parliament can block that initiative.

appointment of a new one. During that period we can treat upcoming elections as exogenously given since their date is announced together with the collapse of a government.

Despite these limitations we believe the data are accurate enough to help us investigate the empirical relationship between terrorism and electoral outcomes.

## **3.2. Empirical Strategy and Results**

### **3.2.1. Impact of Terrorist Attacks on the Israeli Electorate**

According to the first hypothesis of our theoretical model we expect that the relative support for the rightist party increases during periods with high levels of terrorism and decreases during periods of relative calm.

A simple count of deaths from terrorist attacks several months before every election in the studied period is quite revealing. Figure 2 presents the number of deaths from terrorist attacks 150 days prior to elections together with the outcome of the elections. From this circumstantial evidence follows that the leftist party (Labor) won every election when less than 12 people died from terrorist attacks during the five months that preceded the election. In contrast, the rightist party (Likud) won the elections when the number of fatalities from attacks during the five months that preceded the election was 48 or higher. This evidence, obviously, is far from conclusive, as we cannot conduct a meaningful statistical analysis with only five observations.

To increase the number of observations we collected the results of public opinion polls on the intent of voting of the Israeli electorate. The results of these

polls act as a proxy to electorate outcomes and help us overcome the difficulty created by the simultaneous relation between terrorism and electoral outcomes. Panel (a) of Figure 3 displays the basic data. This figure shows the right party's percentage share of the two party vote,  $PSR_t$ , and the number of fatalities from terrorist attacks 30 days before the poll administration date,  $\tau_t$ .<sup>22</sup> These data indicate some patterned relation between the two variables of interest. Most notably, the Israeli electorate's support for the rightist party increases in violent periods and decreases in quiet ones.

To conduct a formal statistical analysis we use the Prais-Winsten estimator on the following model

$$PSR_t = \alpha_0 + \alpha_1 Pollster + \alpha_2 Trend + \alpha_3 Right + \alpha_4 \tau_t + u_t \quad (3.1)$$

where *Pollster* is a dummy variable that controls for the different polling companies used by Ma'ariv; *Trend* is a time trend; *Right* is a dummy variable that equals one when the Prime Minister does not belong to a left wing party;  $\tau_t$  was defined in the preceding paragraph; and  $u_t$  are serially independent shocks. The Prais-Winsten estimator corrects the first-order serially correlated residuals existent in the data according to standard diagnostic tools.<sup>23</sup> We are mainly interested in the

---

<sup>22</sup>In panel (b) we average the available polls administrated within the same month. This is to create a series of evenly spaced observations, which we use to overcome the existent serial correlation problem in the data.

<sup>23</sup> Both the Breusch-Godfrey test and the Durbin's alternative test statistic indicate that the residuals follow an AR(1) process.



$\tau$  coefficient. Through this coefficient we are able to estimate the impact of the level of terrorism on changes on Israelis' current preferences.

An observation is in order. According to a Granger causality test the number of fatalities from terrorist attacks 30 days before the poll administration date is weakly exogenous to the political support ratio for the right wing party.<sup>24</sup>

The results of the estimation of equation (3.1) appear in Table 3. From this table follows that a marginal increase in the number of fatalities from terrorist attacks causes an increase in the support for the Likud party of 0.4 percent evaluated at the averages. This result is not affected by the identity of the party holding office. Moreover, the results are not affected even if the prime minister at the time of the attack belongs to this party.<sup>25</sup> Using different lengths of time to calculate the total number of deaths from terrorism does not affect the results.

Given some of the already mentioned problems with the collected data (namely, the polls don't appear on a regular basis and several different polling companies conducted the collected surveys during the studied period), a significant part of the observed variability might be a consequence of noise produced by sampling error and not a reflection of true movements in public opinion. To accurately separate movements in public opinion from random movements we follow closely the framework pioneered by Green et al. (1999), based on the Kalman filter. The only

---

<sup>24</sup>The results of these tests are available from the authors upon request.

<sup>25</sup>We don't present in Table 3 the model that includes the interaction variable because the coefficient of this variable is not statistically significant.

difference between our analysis and the one developed by Green et al. (1999) is that we incorporate a covariate (deaths from terrorist attacks) that might influence the equilibrium public support for the different political parties.

The algorithm known as the Kalman filter consists, in practice, of a set of algorithms that allows us to optimally separate true movements in public opinions from noise, reducing the amount of measurement error by accumulating information across surveys and smoothing the time series. The Kalman filter delivers, under some regularity assumptions, smoothed estimates that have the smallest mean squared error of any linear weighting scheme applicable to a sequence of polls (Hamilton, 1994). In addition, this methodology allows us to interpolate missing observations and calculate the standard error of these interpolations, gauging the state of opinion during periods when polls were not conducted. This is especially important in our estimation given the available data set, with a high frequency of observations around electoral periods and long intervals without observations as we move farther away from scheduled elections.

Formally, we want to estimate the impact of terrorism on the true support ratio for the rightist party at any point in time,  $TS_t$ . Following our theoretical framework we suppose that the true support for the rightist party is mainly influenced by its prior support and the level of terrorism in the immediate past. The resulting specification is given by

$$TS_t = \theta_0 + \theta_1 TS_{t-1} + \theta_2 \tau_t + \varepsilon_t,$$

where  $\tau_t$  is the total number of fatalities from terrorist attacks 30 days before the

poll administration date, and  $\varepsilon_t$  is the white noise produced by random fluctuations in public opinion. The constant  $\theta_0$  allows for the possibility of the existence of a trend in the relative public support for the parties.

The additional noise introduced by sampling error is reflected in the fact that we don't observe the true political support ratio, but only the polls' estimated support,  $PSR_t$ , where

$$PSR_t = TS_t + v_t,$$

with  $v_t$  being the noise of the measurement process.

Following the Kalman filter algorithms, we generate two alternative series of the public support for the rightist party based on the observed opinion polls: the first series consists of filtered observations whereas the second series consists of smoothed observations. To generate filtered estimates we move forward in time, iterating the polls until the last one available in our data set. In particular, we set the first filtered observation,  $F_1$ , equal to the polls' estimated support,  $PSR_1$ , and adjust succeeding filtered observations according to

$$F_t = W_t PSR_t + (1 - W_t)(\theta_0 + \theta_1 F_{t-1} + \theta_2 \tau_t),$$

where  $W_t$  is an estimator of the public support ratio's mean squared error at time  $t$ .<sup>26</sup>

---

<sup>26</sup>The estimator  $W_t$  depends on the current uncertainty about the true support for the rightist party (partly influenced by  $Var(\varepsilon)$ ) and on the random sampling error of the current poll ( $Var(v_t)$ ). See Green et al. (1999) for the complete characterization of  $W_t$ .

For periods with missing observations the filtered value is given by

$$F_t = \theta_0 + \theta_1 F_{t-1} + \theta_2 \tau_t.$$

On the contrary, to obtain smoothed estimates we use the filtered estimate and uncertainty estimate for each observation and move backward in time, adjusting the smoothed estimate according to the observed difference between the filtered estimate and the observed poll realization. Formally, for the last period  $S_T = F_T$ ; for any other period

$$S_t = F_t + (S_{t+1} - \theta_0 - \theta_1 F_t - \theta_2 \tau_t) \omega_t,$$

where  $\omega_t$  is, as  $W_t$ , an estimator of the public support ratio's mean squared error.<sup>27</sup>

Panels (c) and (d) of Figure 3 depict the filtered and smoothed series, respectively.

We again use the Prais-Winsten estimator to assess the impact of terrorist attacks on the popular support ratio for the rightist party, now applied to the modified data. Table 4 presents the results using the filtered data and Table 5 presents the results for the smoothed data.

As it is readily seen from these two tables, the reached conclusions using raw data are maintained. In particular, the effect of fatalities on the popular support ratio is still significantly positive. Although its coefficient is not as large as before, the observed decrease is not significant. From Tables 4 and 5 follows that a marginal

---

<sup>27</sup>Unlike  $W_t$ , the specification of  $\omega_t$  takes into account the uncertainty about the true support for the rightist party and the random sampling error of the polls for all the available observations. The full derivation of  $\omega_t$  can be found at Green et al. (1999).

increase in the number of fatalities from terrorist attacks causes an increase in the support for the Likud party in the order of 0.3 to 0.35 percent evaluated at the averages, instead of 0.4 percent as obtained according to Table 3.

### **3.2.2. Impact of the Elected Israeli Government on the Level of Terrorism**

A direct implication from our theoretical model is that the level of terrorism and electoral outcomes are simultaneously determined. This introduces the first difficulty while testing the second hypothesis. Additionally, our empirical estimation needs to take into account that not only electoral outcomes, but also the elections' timing, are endogenous to the level of terrorism. As a consequence, we can't use an ordinary regression model to test the effect of the elected Israeli government on the level of terrorism. Those are the reasons that lead us to use a combination of event study methods together with more conventional likelihood ratio tests to assess the validity of the second hypothesis.

We adapt event study methods to analyze the impact of the elected Israeli government on the level of terrorism. The used method treats a given event that occurs at a predetermined point in time as exogenous, and studies the impact of this event on the realizations of a variable of interest.<sup>28</sup> In our case, by taking electoral outcomes as the event of interest, we are able to measure their impact on the level of terrorism.

---

<sup>28</sup>See Campbell et al. (1997) for a general description of event study methods and Abadie and Gardeazabal (2003) for an application of this method to study the impact of terrorism on stock returns in Spain.

As already discussed above, elections' dates in Israel are not always exogenously determined. In fact, only during the period between the fall of a government and the scheduled elections for the appointment of a new one we can treat the date of the upcoming election as exogenous, known both by the Israeli electorate and terrorists alike. Therefore, these are the periods that we use for our analysis.<sup>29</sup>

Another advantage of the used statistical method is that it allows us to perform pairwise comparisons between contiguous governments, thereby distinguishing between governments from the same political party in different time periods. Immediate history has a significant role both in our theoretical model and in Israeli politics. Thus, it would be a mistake to attribute the same effect to leftist governments in different periods, as well as to different rightist governments.

To conduct an event study analysis, we take the day when the date of the forthcoming elections is announced as the day of the event. We define  $t = 0$  as the event day. There are four events in our sample. For every event, we choose two different periods as estimation windows,  $[T_0, T_1]$ . We take for the first period the year preceding October 31, 1991 and compute the average number of fatalities from terrorist attacks during that year. We believe this statistic is a good proxy for  $\tau_0$ . The second period taken for the estimation windows is the event window during the preceding government. This period provides a proxy for  $\tau_{t-1}$ . According to the

---

<sup>29</sup>We obtain similar results when we ignore the fact that elections' dates are endogenous and carry the analysis for the entire term in office for every government.

theoretical model, the relevant statistic is a convex combination of the two.<sup>30</sup> If the analysis delivers similar results for both estimation windows we conclude that the event is significant in the given direction. The end of the event window,  $T_2$ , is determined by the inauguration date of a new government.

For each event we compute the average number of weekly fatalities from attacks during the estimation window,  $\bar{\tau}$ . For every week between 0 and  $T_2$  we calculate the abnormal number of deaths from terrorist attacks,  $AD_t$ , defined as the observed number of deaths minus  $\bar{\tau}$ ; that is,

$$AD_t = \tau_t - \bar{\tau}, \quad 0 < t \leq T_2.$$

We interpret the abnormal number of deaths from attacks over the event window as a measure of the impact of the ideology of a given government on terrorist activity. We aggregate the abnormal deaths into the cumulative abnormal deaths,  $CAD_T$ , in order to draw overall inferences. Formally,

$$CAD_T = \sum_{t=0}^T AD_t.$$

If  $CAD_T$  oscillates around zero, then the studied event has no effect on the level of terrorism. On the contrary, when  $CAD_T$  is significantly different from zero we must conclude that the event has an impact on the level of terrorism. In particular, if

---

<sup>30</sup>In principle all the information needed should already be included in  $\tau_{t-1}$ . Using only the preceding level of terrorism, however, raises identification issues in the empirical estimation. We overcome those identifications problems with the help of an exogenous period that is unaffected by the dynamics of the model.

the theoretical predictions are correct, then the  $CAD_T$  should be positive and increasing for a leftist government following a rightist government, and negative and decreasing for a rightist government that follows a leftist government. When compared to  $\tau_0$ ,  $CAD_T$  should be positive for a leftist government and negative for a rightist government.

Figures 4 and 5 plot the cumulative abnormal deaths for every government in the studied period when compared to  $\tau_0$  and  $\tau_{t-1}$ .

The obtained  $CAD_{T,s}$  are, for the most part, consistent with the theoretical analysis. The evidence supports the hypothesis that the level of terrorism increases during the tenure of a left wing government both when compared to  $\tau_0$  and to  $\tau_{t-1}$  that corresponds to the preceding right wing government. Opposing results are obtained, for the most part, for right wing governments. These trends are especially evident for the governments of Peres, Nethanyahu, and Barak. The  $CAD_T$  corresponding to the unity coalition government led by Sharon between 2001 and 2003 shows a pattern contrary to the one expected for a rightist government. We relate to this finding cautiously though, given that this government is atypical for the reasons already stated in the introduction.

The standard statistical test applied in event studies assumes that  $CAD_T$  is normally distributed. This is clearly not the case in our study given that deaths from terrorist attacks are count data best described by a Poisson distribution. Therefore, we carry the more conventional likelihood ratio test assuming that deaths from terrorist attacks follow a Poisson distribution. For the purposes of this test we carry



pairwise comparisons of realizations of  $\tau$  between 0 and  $T_2$  of contiguous governments, as well as a comparison of every government with the realization of  $\tau$  between October 31, 1990 and October 30, 1991. Our null hypothesis is that the two compared samples are drawn from a Poisson distribution with the same  $\lambda$ . The results appear in Table 6.

These results support the conclusions reached by the event study analysis. In particular, the likelihood ratio test shows that the level of terrorism is significantly higher during the leftist party tenure in office compared to the level before the beginning of the peace process and to the level of the preceding rightist party. The opposite conclusion is reached for the rightist government of Benjamin Netanyahu. All these results are in accordance with the suggestions of the theoretical model. As before, the unity coalition government led by Sharon exhibits a higher level of terrorism compared to both the exogenous level and the level of terrorism observed during its predecessor leftist government.

#### 4. A Discussion of Alternative Hypotheses

As already mentioned, the observed fluctuations on the level of terrorism are also consistent with an alternative model that focuses on terrorism-deterrence policies. We are somewhat skeptical of embedding the terrorism-deterrence argument in an electoral cycles framework, however, because of the implications of such a model on the behavior of Israel's political parties. In particular, this alternative approach renders that political parties do not value holding office. According to our results the support for the right wing party increases in periods with high level of terrorism, even if that party is holding office during those periods. From these findings it follows that the leftist party has greater incentives than the rightist party to lower the number of fatalities from terrorism. This effect should certainly induce the left wing party to enact deterrence policies that lower as much as possible the expected number of victims.<sup>31</sup> Not surprisingly this is what we observe from the available data.

Table 7 depicts the average number of days when a total or partial closure was imposed on the West Bank and Gaza Strip. The evidence provided in this table seems to contradict part of the premises of the deterrence policy hypothesis. Namely, the left wing party is much more aggressive than the right wing party in imposing closures on the occupied territories during the analyzed periods.<sup>32</sup>

---

<sup>31</sup>There is no reason to believe that one party is more efficient in terrorism deterrence than the other. The Israeli Defense Forces are not influenced by the party holding power and the feasible policy options are the same regardless of the ideology of the governing party.

<sup>32</sup>We view closures as a proxy for the government's deterrence policy. In reality there are

If we accept the view (partly substantiated by Table 7) that the leftist party adopts tougher deterrence policies, then the increase in the level of terrorism can only be explained by focusing on the Palestinians' strategy. In other words, only an increase in the number of attacks against left wing governments relative to attacks against right wing governments can explain the documented fluctuations in the level of terrorism. What drives the Palestinians to increase the number of attacks against left wing governments? On this the deterrence policy hypothesis remains silent. Our paper, on the other hand, presents a new rationale that is consistent both with the documented preferences of the Israeli citizens and the observed fluctuations in the level of terrorism.

---

alternative deterrence measures (as curfews and administrative detention of civilians) that a government could implement to thwart terrorist attacks. Unfortunately, we were unable to obtain information on these alternative measures.

## 5. Conclusion

This paper studied the interaction between terrorism and electoral outcomes focusing on the Israeli-Palestinian conflict. The equilibrium of our theoretical model predicted that the support for the rightist party in Israel increases after periods with high levels of terrorism, and that the expected level of terrorism is higher during the leftist party's tenure in office. We tested the predictions above combining data on the Israeli electorate's intent of voting with a newly culled data set on terrorist attacks in Israel. The findings of the empirical analysis support the theoretical predictions. Namely, we observe that a marginal increase in the number of fatalities from terrorism causes a significant increase in the relative support for the rightist party. Moreover, event study analysis and likelihood ratio tests show that, in general, the level of terrorism increases during the leftist party's tenure in office and decreases during the rightist party's tenure.

A justification is in order with regard to the chosen modeling strategy. The model presents the conflict asymmetrically. Accordingly, Palestinians commit terrorist attacks and Israelis elect governments. A more accurate reflection of the conflict would take into account that Israeli violence and state terrorism against Palestinians also influence the political preferences of the Palestinians as well as their chosen retaliatory strategy. Although such a model seems plausible theoretically, several difficulties would preclude us from being able to estimate its predictions. The most important is perhaps the absence of a political system in the territories under Palestinian control that would allow for a democratic election of a political party different from Fatah (the faction led by Yasser Arafat) to the

leadership of the PA. This implies that changes in the observed Israeli strategy cannot be explained as reactions to Palestinians' electoral outcomes. In any event, the empirical results in Goldstein et al. (2001) show that whereas Israel reciprocated Palestinian cooperation and conflict during the 1990s, Palestinians did not reciprocate Israel's. This finding casts a serious doubt on the empirical validity of this alternative approach.

In summary, we believe that our approach captures the salient characteristics of the Israeli-Palestinian conflict. The theoretical model develops a structure for thinking about the causes and consequences of terrorism. On top of that, it delivers precise empirical predictions that are supported by the available data. We do not dispute that alternative approaches might account for some of the observed empirical patterns. In fact, we see our thesis as complementary, and not alternative, to existing views of the interaction between terrorism and electoral outcomes.

Although much further work remains to be done if we are to understand the connection between terrorism and electoral outcomes, we believe that our approach can be applied, with minor changes, to the study of similar conflicts elsewhere. The conflicts in the Basque country, Northern Ireland, and British Mandate Palestine, to name a few, share a number of similarities with our case study, allowing for an immediate application of the developed theoretical framework. In all these conflicts one group resorts to terrorism with the objective to obtain political emancipation from an occupying force; the group vying for emancipation is subdivided into two subgroups, moderates and extremists, which have different political objectives; and these groups use terrorism, at least in part, to influence the electorate of the

occupying force. Obviously, each case has some particularities that must be taken into account if one is to conduct a rigorous analysis. It is our hope that further research on these and other conflicts will lead us to a broader understanding of the dynamic interaction between terrorism and its political environment.

## References

- Abadie, Alberto, and Javier Gardeazabal. 2003. "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review* 93 (March): 113-32.
- Berrebi, Claude. 2003. "Evidence About the Link Between Education, Poverty and Terrorism Among Palestinians." IRS Working Paper 477 (September), Princeton University.
- Brophy-Baermann, Bryan, and John A. C. Conybeare. 1994. "Retaliating Against Terrorism: Rational Expectations and the Optimality of Rules versus Discretion." *American Journal of Political Science* 38 (February): 196-210.
- Bueno de Mesquita, Ethan. 2004. "Conciliation, Commitment, and Counter-Terrorism: A Formal Model." *International Organization*, forthcoming.
- Bueno de Mesquita, Ethan. 2003. "Conciliation, Counter-Terrorism, and Patterns of Terrorist Violence: A Comparative Study of Five Cases." Washington University at Saint Louis, Typescript.
- Campbell, John Y., Andrew W. Lo, and Archie Craig MacKinlay. 1997. *The Econometrics of Financial Markets*. New Jersey: Princeton University Press.
- Enders, Walter, and Todd Sandler. 2002. "Patterns of Transnational Terrorism, 1970-99: Alternative Time Series Estimates." *International Studies Quarterly* 46(June): 145-65.
- Enders, Walter, and Todd Sandler. 1993. "The Effectiveness of Antiterrorism Policies: A Vector-Autoregression-Intervention Analysis." *American Political Science Review* 87 (December): 829-44.

- Goldstein, Joshua A., Jon C. Pevehouse, Deborah J. Gerner, and Shibley Telhami. 2001. "Reciprocity, Triangularity, and Cooperation in the Middle East, 1979-97." *The Journal of Conflict Resolution* 45 (October): 594-620.
- Green, Donald P., Alan S. Gerber, and Suzanna L. De Boef. 1999. "Tracking Opinion Over Time: A Method for Reducing Sampling Error." *Public Opinion Quarterly* 63 (Summer): 178-92.
- Hamilton, James D. 1994. *Time Series Analysis*. NJ: Princeton University Press.
- "How Many Parliament Seats is a Terrorist Attack Worth?" 2003. *Yediot Aharonot*, Jan 10.
- Hroub, Khaled. 2000. *Hamas: Political Thought and Practice*. Washington DC: Institute for Palestine Studies.
- Kimmerling, Baruch S., and Joel S. Migdal. 2003. *The Palestinian People: A History*. Massachusetts: Harvard University Press.
- Kydd, Andrew, and Barbara F. Walter. 2002. "Sabotaging the Peace: The Politics of Extremist Violence." *International Organization* 56 (Spring): 263-96.
- Mailath, George J., and Larry Samuelson. 2001. "Who Wants a Good Reputation?" *Review of Economic Studies* 68 (April): 415-41.
- Mishal, Shaul, and Avraham Sela. 2000. *The Palestinian Hamas: Vision, Violence, and Coexistence*. New York: Columbia University Press.
- Oots, Kent L. 1986. *A Political Organization Approach to Transnational Terrorism*. Westport, Connecticut: Greenwood Press.
- Pape, Robert A. 2003. "The Strategic Logic of Suicide Terrorism." *American Political Science Review* 97 (August): 1-19.



**Table 1 Summary Statistics**

	Deaths from terrorist attacks since 1949	Deaths from terrorist attacks since October 31, 1991***	Number of fatal terrorist attacks since 1949	Number of fatal terrorist attacks since October 31, 1991***	Deaths from suicide attacks since 1949	Deaths from suicide attacks since October 31, 1991***	Number of fatal suicide attacks since 1949	Number of fatal suicide attacks since October 31, 1991***
Daily Avg.	0.0955	0.2283	0.045	0.0872	0.0276	0.1252	0.0041	0.0182
Daily STD	0.8403	1.44	0.2264	0.3228	0.6275	1.3377	0.0697	0.1471
Daily Max	33	29	3	3	29	29	3	3
Daily Min	0	0	0	0	0	0	0	0
Weekly** Avg.	0.6683	1.5967	0.3151	0.6099	0.193	0.876	0.0285	0.1273
Weekly** STD	2.4846	4.3729	0.7109	1.0547	1.7797	3.7363	0.2062	0.4252
Weekly** Max	41	41	8	8	32	32	3	3
Weekly** Min	0	0	0	0	0	0	0	0
Monthly Avg.	2.9066	6.9496	1.3706	2.6547	0.8392	3.813	0.124	0.554
Monthly STD	7.2485	12.8826	2.0877	3.2565	5.0076	9.8434	0.5851	1.111
Monthly Max	112	112	23	23	79	79	8	8
Monthly Min	0	0	0	0	0	0	0	0
Yearly* Avg.	35	76	16	30	10	41	1	6
Yearly* STD	52.8152	94.5855	17.0059	27.1862	33.5813	60.744	4.8833	8.7698
Yearly* Median	25	51	11	20	0	24	0	3
Yearly* Mode	3	#N/A	3	17	0	0	0	0
Yearly* Max	351	351	89	89	218	218	32	32
Yearly* Min	0	6	0	4	0	0	0	0
<b>TOTAL</b>	<b>1898</b>	<b>966</b>	<b>895</b>	<b>369</b>	<b>548</b>	<b>530</b>	<b>81</b>	<b>77</b>

\* the year 2003 goes only until May30

\*\* weeks start on Sunday and end on Saturday

\*\*\* yearly data include the entire year 1991

**Table 2**

**Summary Statistics From Polls (Between Feb 14, 1992 to Jan 26, 2003)**

	About the number of days between polls	percent support for left-wing candidate*	percent support for right-wing candidate*	Knesset seats for left-wing party (according to poll)**	Knesset seats for right-wing party (according to poll)**	PSR
Average	21.973	39.16%	40.47%	39.417	63	0.518007
STD	51.519	0.097	0.077	2.503	2	0.104912
Median	9	41.00%	40.00%	40.5	63	0.488372
Mode	7	43.00%	41.00%	41	63	0.5
Max	595	60.00%	63.00%	42	65	0.84
Min	2	11.00%	25.00%	36	58	0.308642
* Relevant only between Feb 14, 1992 and October 4, 2002 (since November 2002 percentages are no longer presented in terms of candidate support but in terms of number Knesset of seats for party)						
** Relevant only between November 15, 2002 and January 26, 2003 (since November 2002 percentages are no longer presented in terms of candidate support but in terms of number Knesset of seats for party)						

Table 3: Prais-Winsten Estimates for the Political Support Ratio between Likud (right) and Labor (left) Parties (PSR)<sup>†</sup>

Political Support Ratio (Monthly Averages)				
Intercept	0.5398 <sup>***</sup> (0.0337)	0.5279 <sup>***</sup> (0.0295)	-0.1061 (0.2699)	-0.0559 (0.2773)
Deaths <sub>t</sub>	0.0009 <sup>***</sup> (0.0004)	0.0012 <sup>***</sup> (0.0004)	0.0012 <sup>***</sup> (0.0004)	0.0011 <sup>***</sup> (0.0004)
Pollster Dummy		0.0940 <sup>***</sup> (0.0346)	0.0858 <sup>**</sup> (0.0349)	0.0836 <sup>***</sup> (0.0348)
Time Trend			0.0014 <sup>***</sup> (0.0006)	0.0012 <sup>***</sup> (0.0006)
No Left dummy (yes = 1)				0.0413 (0.0365)
Rho	0.9343	0.9182	0.8867	0.8907
Num. of Obs.	86	86	86	86
Adj. R-squared	0.6092	0.6634	0.7123	0.7099

<sup>†</sup> PSR is the ratio of the support for the Likud (right) party/candidate over the sum of support for the Likud ((right) and Labor (left) parties/candidates from the respective poll.

\*\*\* coefficient is significant at 1% level.

\*\* coefficient is significant at 5% level.

\* coefficient is significant at 10% level.

Table 4: Prais-Winsten Estimates for the Political Support Ratio between Likud (right) and Labor (left) Parties (PSR<sub>t</sub>) – Filtered Series†

Political Support Ratio (Monthly Averages)				
Intercept	0.5151 <sup>***</sup> (0.0479)	0.5105 <sup>***</sup> (0.0432)	0.0151 (0.3228)	0.0174 (0.3228)
Deaths <sub>t</sub>	0.0007 <sup>**</sup> (0.0003)	0.0008 <sup>***</sup> (0.0003)	0.0008 <sup>***</sup> (0.0003)	0.0008 <sup>***</sup> (0.0003)
Pollster Dummy		0.0475 <sup>***</sup> (0.0182)	0.0478 <sup>***</sup> (0.0184)	0.0479 <sup>***</sup> (0.0184)
Time Trend			0.0011 (0.0007)	0.0011 (0.0007)
No Left dummy (yes = 1)				0.0023 (0.0176)
Rho	0.9420	0.9364	0.9097	0.9091
Num. of Obs.	132	132	132	132
Adj. R-squared	0.1268	0.1700	0.2052	0.1998

† PSR is the ratio of the support for the Likud (right) party/candidate over the sum of support for the Likud ((right) and Labor (left) parties/candidates from the respective poll.

\*\*\* coefficient is significant at 1% level.

\*\* coefficient is significant at 5% level.

\* coefficient is significant at 10% level.

Table 5: Prais-Winsten Estimates for the Political Support Ratio between Likud (right) and Labor (left) Parties (PSR) – Smoothed Series†

Political Support Ratio (Monthly Averages)				
Intercept	0.5209 <sup>***</sup> (0.0619)	0.5175 <sup>***</sup> (0.0579)	-0.0086 (0.3870)	-0.0071 (0.3863)
Deaths <sub>t</sub>	0.0003 (0.0002)	0.0005 <sup>***</sup> (0.0002)	0.0005 <sup>***</sup> (0.0002)	0.0005 <sup>***</sup> (0.0002)
Pollster Dummy		0.0380 <sup>***</sup> (0.0150)	0.0382 <sup>***</sup> (0.0151)	0.03821 <sup>***</sup> (0.0151)
Time Trend			0.0012 (0.0008)	0.0012 (0.0008)
No Left dummy (yes = 1)				0.0030 (0.0147)
Rho	0.9651	0.9632	0.9451	0.9447
Num. of Obs.	132	132	132	132
Adj. R-squared	0.1012	0.1410	0.1778	0.1725

† PSR is the ratio of the support for the Likud (right) party/candidate over the sum of support for the Likud ((right) and Labor (left) parties/candidates from the respective poll.

\*\*\* coefficient is significant at 1% level.

\*\* coefficient is significant at 5% level.

\* coefficient is significant at 10% level.

Table 6: Likelihood Ratio Tests†

Primer Minister	Event Window	MLE	Joint MLE			
			With pre-MPC* MLE	LR	With Predecessor MLE	LR
Shimon Peres	Feb12, 1996 - Jun19, 1996	3.5556	1.4347	28.03	1.7954‡	23.19
Benjamin Nethanyahu	Dec21, 1998 - Jul7, 1999	0.1071	0.4810	6.89	1.4565	42.81
Ehud Barak	Dec10, 2000 – Mar8, 2001	2.0833	0.9523	7.04	0.7	18.79
Ariel Sharon	Nov5, 2002 – Feb28, 2003	4.4706	1.6323	40.17	3.4827	5.32

† All tests have one degree of freedom

\* pre-MPC stands for the year that preceded the beginning of the peace process at the Madrid Peace Conference. The pre-MPC maximum likelihood estimator is 0.6863.

‡ The government led by Prime Minister Yitzhak Shamir preceded the one led by Peres. Shamir government's MLE is 0.5769.

Table 7: Total and Partial Closures Imposed on the West Bank and Gaza Strip†

Primer Minister	Event Window	Number of Days	Days of Closure			Total Closure <sup>Y</sup>
			West Bank	Gaza Strip	Partial Closure <sup>§</sup>	
Shimon Peres	Feb12, 1996 - Jun19, 1996	130	80	85	28	57
Benjamin Nethanyahu	Dec21, 1998 - Jul7, 1999	199	9	9	0	9
Ehud Barak	Dec10, 2000 – Mar8, 2001	89	49	85	16	69
Ariel Sharon	Nov5, 2002 – Feb28, 2003	116	0	0	0	0

† The data for the governments of Shimon Peres and Benjamin Nethanyahu were obtained from B'tselem ([www.btselem.org](http://www.btselem.org)). The data for the governments of Ehud Barak and Ariel Sharon were obtained from the Palestinian Centre for Human Rights ([www.pchrgaza.org](http://www.pchrgaza.org)).

§ Partial Closure: a siege, enforced through road blocks, prevents entry and exit from areas, towns and villages ([www.btselem.org](http://www.btselem.org)).

Y Total Closure: prohibits the entry of Palestinians into Israel for any purpose; the safe passage between the West Bank and the Gaza Strip is closed; the international border crossings are closed as well ([www.btselem.org](http://www.btselem.org)).

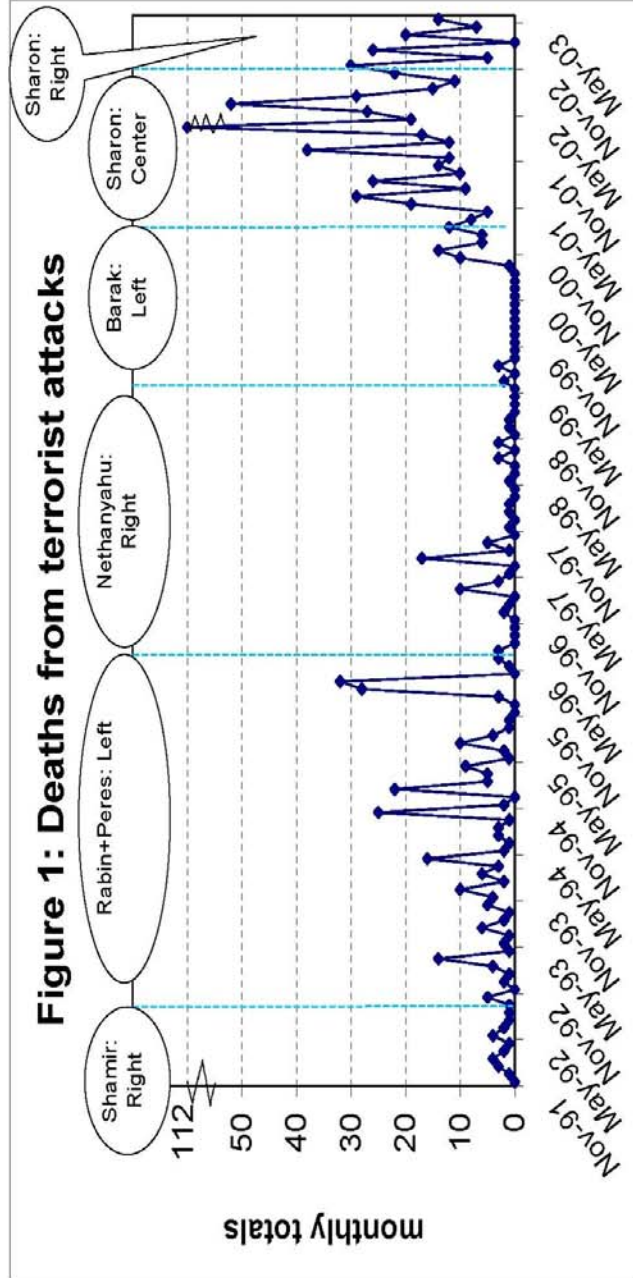
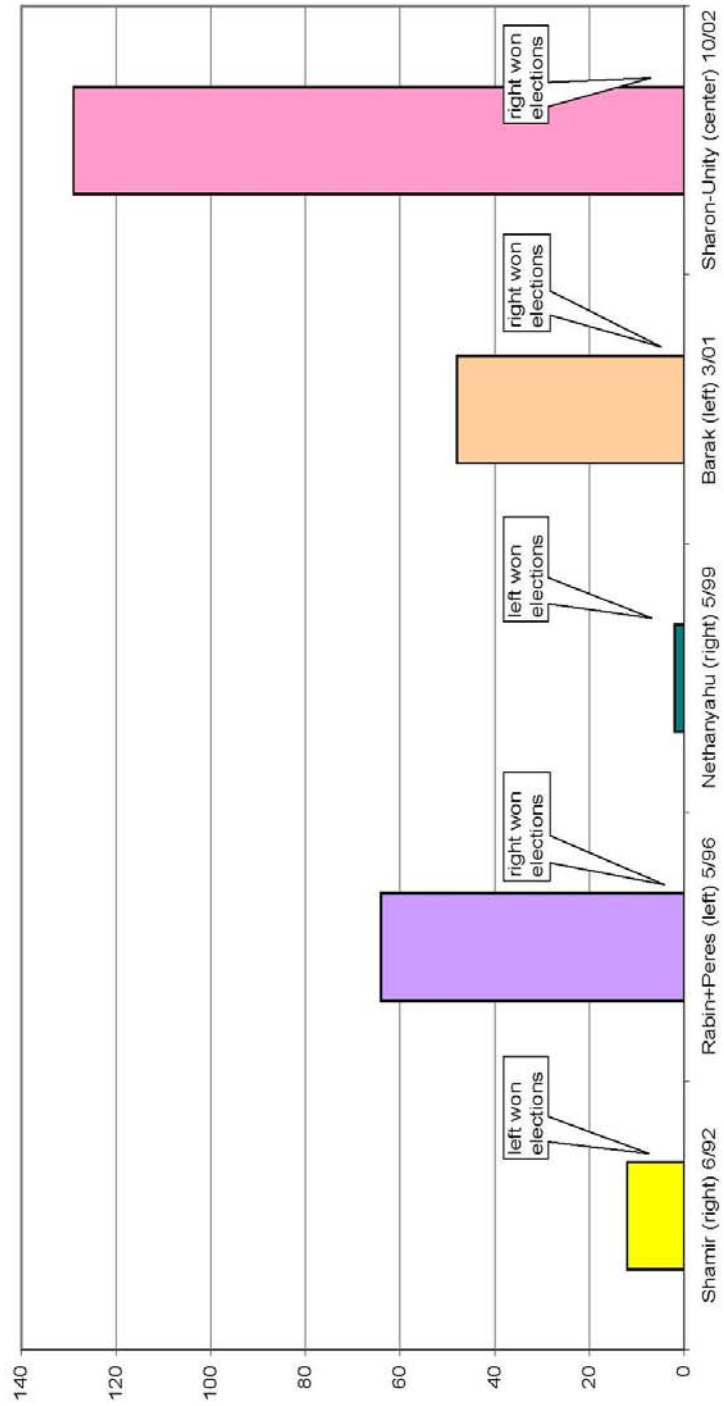


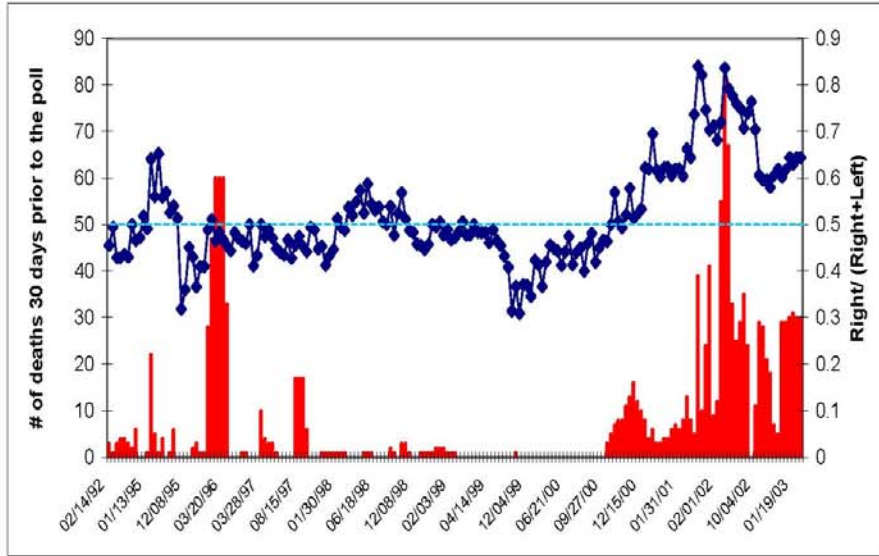


Figure 2: Deaths from terrorist attacks in the last 150 days prior to elections

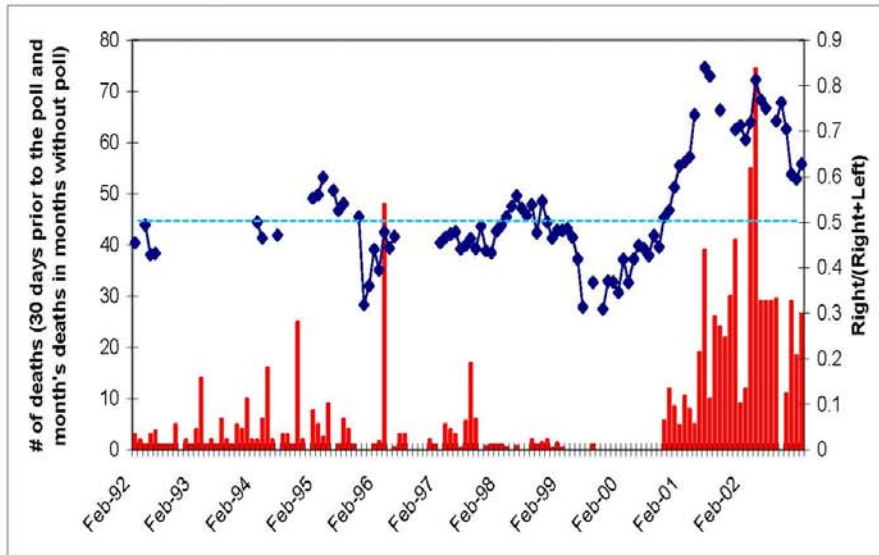


**Figure 3: Political support and deaths from terrorist attacks**

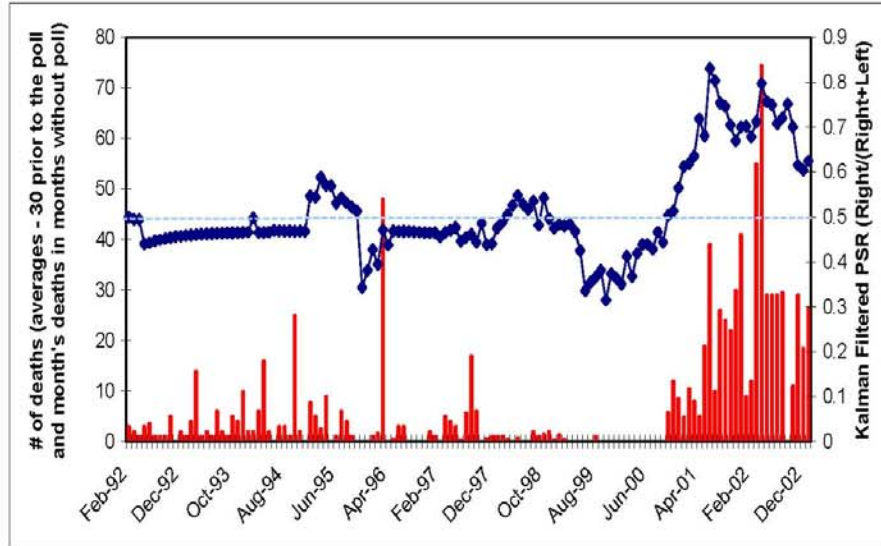
a. All available polls (x-axis does not reflect time interval between contiguous polls)



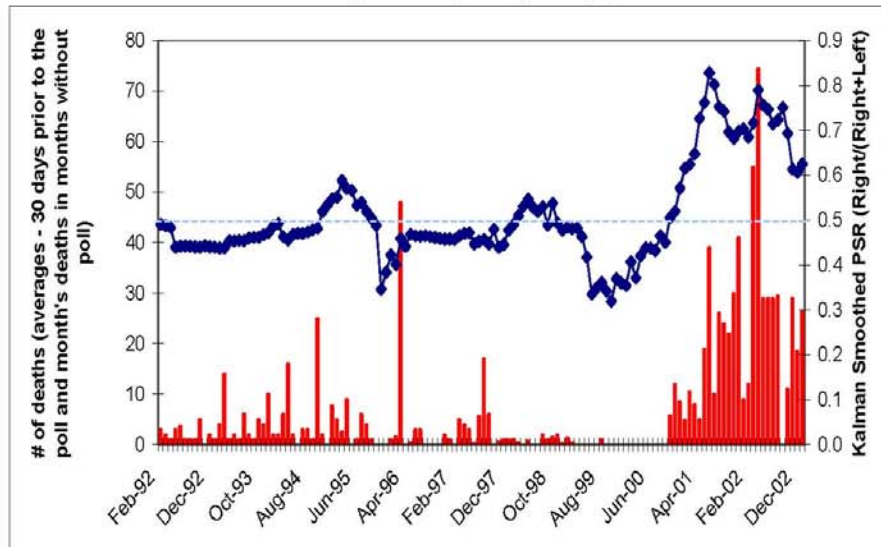
b. Monthly averages



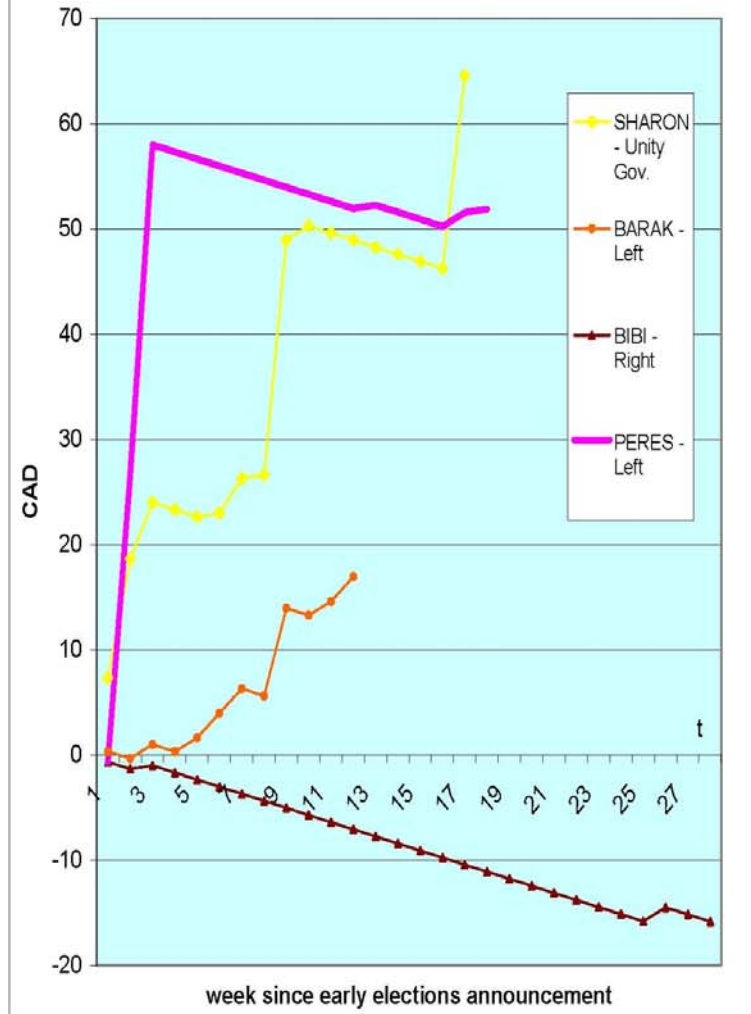
c. Kalman Filtered Political Support Ratio (monthly averages)



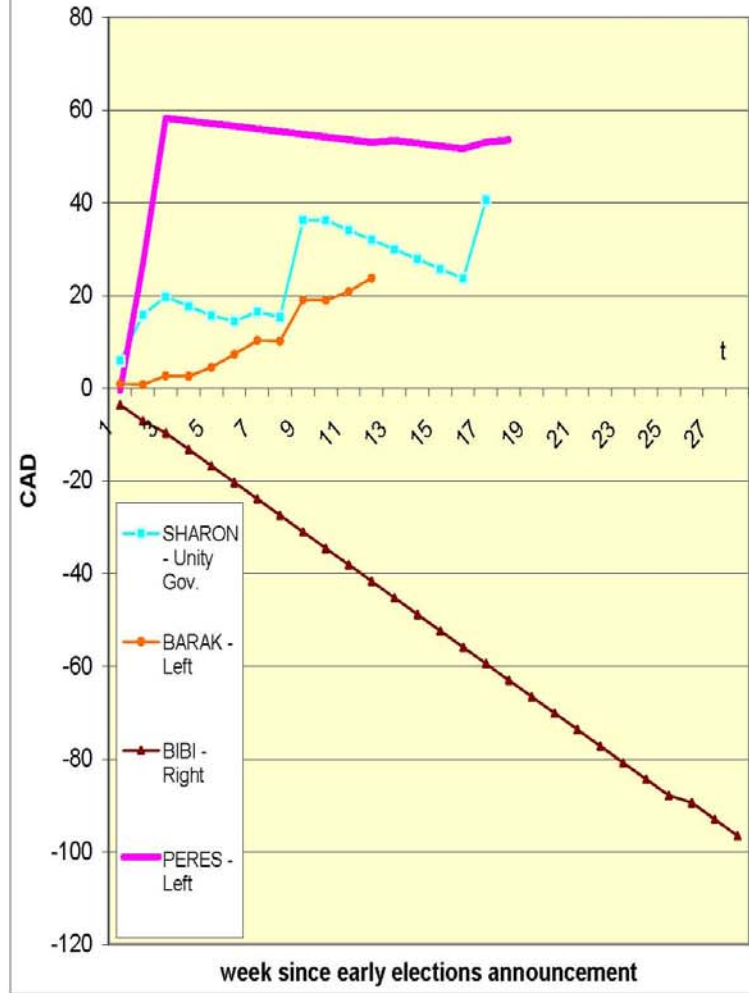
d. Kalman Smoothed Political Support Ratio (monthly averages)



**Figure 4: CAD** - comparison period is from the year preceding the Madrid Peace Conference



**Figure 5: CAD - comparison period is from the preceding elections (under previous gov.)**



### Chapter 3

## Consequences of Terrorism: A Stock Market Analysis of Israeli Companies\*

Claude Berrebi

#### Abstract

This paper employs scoring matching techniques and event study analysis to disentangle the impact of terrorism across different economic sectors. In particular, differentiation is made between Israeli companies that are involved in or with defense, security or anti terrorism related industries and other companies. The findings show that whereas terrorism has a significant negative impact on non-defense related companies, the overall effect of terrorism on defense and security related companies is significantly positive. These results suggest that the expectation of future high levels of terrorism has significant implications on the allocation of resources across industries.

---

\* Yaakov Garini provided invaluable help in the construction of the data set. The author thanks Princeton University's Industrial Relations Section for its support. All responsibilities for the content and potential errors of this article are solely mine.

## 1. Introduction

Politically motivated violence in general and terrorism in particular have a strong negative effect on economic prosperity. That is, at least, the main message obtained from a rapidly growing literature that analyzes the effects of terrorist acts on various aspects of the economy. Although there is no reason to believe that the economic impact of a similar terrorist attack is uniform across economic activities, the extant literature seldom compares the impact of terrorism across industries.

This paper provides a first attempt at analyzing the possibly different impact of terrorism across industries in a given country. In particular, the main objective is to assess whether the impact of terrorism on the defense and security related industries is different from its impact on the rest of the economic sectors. To that purpose I focus on Israeli companies that traded at American markets and build, using matching score methods, a control group consistent of American companies. Using Israeli companies traded in the same market as their counterfactuals helps avoid potential biases that exist when stock valuations are compared across different stock markets. The valuation of each Israeli company and its assigned American “counterpart” enable me to differentiate between the effect of terrorism on companies involved in or with the defense, security or antiterrorism industries (henceforth defense related companies) and other companies.

The results show that terrorism doesn't have a significant impact on the average valuation of Israeli companies' stocks vis-à-vis the valuation of the control group's stocks. However, after controlling for defense related companies,

the obtained impact of terrorism on these companies is positive and significant, and negative and significant for the other companies. The results are robust to different samples of Israeli companies, different measures of terrorism, and different econometric specifications.

This paper contributes to the growing number of studies that, focusing on the Israeli-Palestinian conflict, attempt to quantify the economic costs of terrorism. Naturally, the empirical literature quantifying the effects of political conflict on the Israeli economy has used time series analysis. Fishelson (1993) studies the impact of the first Palestinian uprising (Intifada) on the levels and trends of the various real economic activities in Israel between the years 1987-89. Fielding (2003a, 2003b) investigates the impact of political instability on saving and investment, respectively, during the period 1987-99. Eckstein and Tsiddon (2004) conduct a similar analysis on consumption, investment, exports and GDP per capita. And Eldor and Melnick (2004) study the impact of terrorism on the valuation of companies that trade at the Tel Aviv Stock Market and the Israeli foreign exchange rate.

A fundamental problem when trying to quantify the effect of terrorism on economic fluctuations is that the obtained estimates might be biased due to a plausible interaction between the two variables. The studies above use different approaches to identify the effect of terrorism and politically motivated violence on the economic variable of interest from the effect of other macroeconomic distortions and shocks. Fishelson (1993) uses the years 1985-1987 that preceded the first Intifada as his source of identification. Fielding (2003a, 2003b) relies on the relative stability of the Israeli economy after 1984 and includes in his analysis several control variables to isolate the effect of terrorism; a similar



approach is undertaken by Eckstein and Tsiddon (2004). Finally, Eldor and Melnick (2004) include in their analysis the S&P500 index as a control to help them identify the effect of terrorism on the valuation of an index that includes the 100 biggest companies traded at the Tel Aviv Stock Exchange.

These prior efforts to identify the impact of terrorism might not be enough to overcome the intrinsic difficulty of the task. To overcome those problems I follow the study of Abadie and Gardeazabal (2003, henceforth AG) on the Basque Country. As AG, a control group is constructed and an event study approach is used to assess the impact of the Israeli-Palestinian conflict on Israeli companies' stock returns.

There exist, however, several important differences between the analysis performed in this paper and the one undertaken by AG. Firstly, the proposed approach uses a propensity score matching method following Dehejia and Wahba (2002) to find the closest counterfactual stock for each of the Israeli stocks, while AG use the stocks of all the Spanish companies unexposed to the Basque Country as their control variable. Secondly, the greater fluctuation in the number of casualties of the Israeli-Palestinian conflict relative to the conflict in the Basque Country is exploited to better assess the economic impact of a terrorist attack. AG's results on the impact of conflict on the returns of Basque stocks relative to non Basque stock are based on two dummy variables that reflect whether the unilateral truce declared by ETA was credible or not. They do not quantify the marginal economic cost of an additional terrorist attack nor the impact of small changes on the credibility of the truce. This paper, using the available detailed data on the daily number of terrorist attacks, estimates the economic cost of terrorist attacks measured on a daily, weekly and monthly

basis. Finally, unlike AG, the impact of terrorism is decomposed to identify the different effects of terrorism on defense versus non-defense related companies.

## 2. Data Description

For the purposes of this research all the Israeli companies that traded, as of November 2001, on the Amex, NYSE or Nasdaq, were identified following the classification provided by a leading financial research center specializing in analyzing and monitoring Israeli companies.<sup>1</sup> This results in an original sample of 125 Israeli companies. Table 1 provides a list of all the companies identified as Israeli.

For each Israeli company a set of prospective "counterparts" was built, containing US companies traded on the same market and from the same industry. For all of these companies (Israelis and their set of prospective counterparts) daily end-of-the-day stock prices were collected for the sample period January 1, 1998 – September 10, 2001.<sup>2</sup>

The procedure used to find a US company whose stock gave the best fit for an Israeli company based on the period 1994-1997 can be described in several steps. First, the size and book-to-market ratio (BE/ME) for each and every stock was calculated as in Fama and French (1993). With these characteristics at hand I obtained the coefficients measuring the returns of the size and book-to-market equity factors for every stock from Fama and French

---

<sup>1</sup> In particular, the classification used was the one provided by Globes, a leading Israeli financial newspaper. This classification is not according to the companies registered addresses. Rather, it identifies companies that were perceived to carry a significant part of their business in Israel.

<sup>2</sup> Companies that didn't trade before January 1<sup>st</sup>, 1998 were deleted from the sample. Only companies that traded both before and after September 28, 2000 were included, however companies were included even if some didn't have complete data for the entire sample period.

(1993). The coefficient measuring the excess market return for each company was obtained from "Security Risk Evaluation," published quarterly by Merrill Lynch. The excess return coefficient of the companies whose parameter was unavailable from "Security Risk Evaluation" was computed following the same methodology employed by this publication.<sup>3</sup> The market's benchmark factors ( $R_m - R_f$ , SMB, HML) for the period 1994-1997,<sup>4</sup> were obtained from the calculations provided by Fama and French in French's website ([http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)).

Each company's coefficients were then weighted, using the market benchmark factors to obtain the company's score. This score thus reflects the important characteristics of the company and allows a comparison across different stocks. For every Israeli company its chosen American "counterpart" company was the one within the prospective set of counterparts that minimized the distance to the Israeli company's score. The final sample of Israeli companies as well as their respective American counterparts, consisting of 65 pairs of companies, appears in Table 2.

For the purposes of the empirical estimation companies were further classified according to their main economic activity. A separation was then made between defense related companies and the rest of the companies. This classification was done according to the companies profile made by market analysts on yahoo finance and information publicly provided by the companies

---

<sup>3</sup> The necessary data to calculate the excess return of these companies were obtained from the Center for Research in Security Prices (CRSP) data set.

<sup>4</sup> The data was collected for the entire 1994-2001 periods for later use in the computation of the expected returns of the companies described below.

in their own websites or other financial websites. Out of the sample 23 Israeli companies were found to be involved in or with the defense, security or antiterrorism industries. These companies are identified from the rest of the companies in Table 2.

Table 3 provides summary statistics differentiating between defense related and not defense related companies. Both types of companies experienced, on average, lower abnormal returns than their counterparts during the analyzed time period. The main difference across sectors is observed before the Palestinian uprising that started on September 28, 2000. For that period, the abnormal returns of defense related companies are lower relative to the one observed for their counterparts, whereas the abnormal returns of the rest of the Israeli companies are higher than the one observed for their counterparts. All four groups of companies exhibit negative abnormal returns between January 1, 1998 and September 28, 2000 and positive abnormal returns for the remaining of the analyzed period. This observation highlights the importance of the control group. For, in the absence of a proper control group a significantly positive effect of terrorism on the stock valuations of the Israeli companies would have been wrongfully obtained.

The daily number of terrorist attacks is used to measure the level of terrorism. The particular definition of terrorist attacks employed for the construction of the data set is the one stated by the US State Department, contained in Title 22 of the United States Code, Section 2656f(d). Accordingly,

"-- The term "terrorism" means premeditated, politically motivated violence perpetrated against noncombatant targets by sub national groups or clandestine agents, usually intended to influence an audience."

Specifically, the data set on terrorist attacks contains daily information on each and every *fatal* terrorist attack against *noncombatants* that occurred on *Israeli soil* from January 1<sup>st</sup>, 1998 until September 10, 2001.<sup>5</sup>

Several explanations on the used definition of terrorist attack are in order.

a. Fatal: Due to the collection procedure constraints, only attacks in which someone besides the terrorist died were included.

b. Noncombatants: This term is interpreted to include, in addition to civilians, military personnel who at the time of the incident are unarmed and/or not on duty.

c. Israeli Soil: This includes occupied territories when under Israeli control.

The main sources of the data are the Israeli Foreign Ministry, the National Insurance Institute, the Israeli Defense Forces and two newspapers archives (Ma'ariv and Ha'aretz).

To the best of my knowledge, this is the most accurate and comprehensive unclassified data set regarding fatal terrorist attacks against noncombatants on Israeli soil. The data are depicted in Figure 1. Summary statistics appear at Table 4. Figure 1 and Table 4 clearly reflect the impact of the second Palestinian uprising. On average, there was less than one monthly attack between January 1<sup>st</sup>, 1998 and September 28, 2000. From September 28, 2000 until September 10, 2001 the monthly average number of attacks increased to 7.25.

---

<sup>5</sup> The available data set on terrorist attacks extends, in fact, from 1949 until 2003. See Berrebi (2003) for a detailed description of the data set and its sources.

Several potential problems with the data are worth emphasizing. First, the data on terrorist attacks only indicate attacks in which someone besides the terrorist died. Thus, foiled attacks as well as "unsuccessful" attacks in terms of producing fatalities are not included. Terrorist attacks outside Israeli soil were not included either. Since the just mentioned types of attacks might impact the stock market valuation of Israeli companies vis-à-vis their American counterparts relevant terrorist events might be omitted.

Second, some of the stocks of the Israeli companies are dually listed and traded both in an American market and the Tel Aviv Stock Exchange (TASE).<sup>6</sup> Given that short-term arbitrage opportunities are generally not available, it has been shown that for these type of stocks the domestic country usually emerges as the dominant market and the foreign market as the satellite one (Lieberman et al. (1999)). Therefore, share prices of these companies are mainly determined at the TASE, casting serious doubts about the validity of matching them with their American counterparts. In particular, differences in returns between stocks that are dually-listed and their respective counterpart could be attributed to differences in the general performance of the TASE relative to the respective American market and not necessarily to the effect of terrorism that only affects Israeli companies. The problem is solved by repeating the same analysis for all the companies and for the set of companies excluding arbitrage stocks.

A third potential concern with the data is that observed fluctuations on the stock returns of Israeli companies might be caused by shocks to the Israeli economy that are not related to terrorism. If this is indeed the case an Israeli

---

<sup>6</sup> From the resulting 65 Israeli companies in the sample there were 15 companies that by January 1, 1999 were dually-listed in two markets. These companies are identified in Table 2.

premium should be observed as well. According to the econometric specification if indeed a premium exists, it would be captured by the intercept. On a similar note, every pair of companies might exhibit a specific permanent effect on their abnormal returns due to particularities of these two companies. For that reason all of the econometric estimations are repeated with added fixed effects to every set of companies.



### 3. Methodology

This section develops the empirical strategy used to test the impact of terrorism on stock returns. For that purpose event study methods are employed, whereby a given event that occurred at a predetermined point in time is treated as exogenous, and the impact of this event on the realization of a variable of interest is then studied (Campbell et al., 1997). In this case terrorist attacks are taken as the event of interest and their effect on the stock returns of Israeli companies relative to American companies is measured.

The full econometric estimation proceeds in several steps. In the first step the daily abnormal returns of every stock in the data set during the analyzed period is computed. This step proceeds as follows. First, the expected returns of company  $i$ 's stock at date  $t$ ,  $\hat{R}_t^i$ , is obtained from the following equation,

$$(1) \quad \hat{R}_t^i = R_t^f + \beta_1^i R_t^m + \beta_2^i SMB_t + \beta_3^i HML_t,$$

where  $R_t^f$  is the market's risk-free rate,  $R_t^m$  is the excess return on the market portfolio,  $SMB_t$  is the difference between the returns of portfolios composed by small and big size stocks, and  $HML_t$  is the difference between the returns of portfolios composed by high and low book-to-market stocks, all measured at time  $t$ .

The abnormal return of stock  $i$  at time  $t$ ,  $AR_t^i$ , is then given by the difference between the observed returns and the expected returns,

$$(2) \quad AR_t^i = R_t^i - \hat{R}_t^i.$$

The next step is to subtract from the abnormal returns of every Israeli stock the abnormal return of its counterpart, in order to obtain the difference in

abnormal returns for every pair of counterparts,  $DAR_t^i$ . In the final step the following model is estimated,

$$(3) \quad DAR_t^i = \alpha_1 + \alpha_2 Ter_t + v_t$$

where  $Ter_t$  is a proxy to the existent level of violence in Israel.<sup>7</sup>

Therefore, the coefficient  $\alpha_2$  reflects the economic impact of an increase in the level of terrorism on Israeli stocks relative to their American counterparts.

The common wisdom accepted so far implies that the expected economic impact of terror should be significantly negative. This is indeed the conclusion reached by a large number of studies using Israeli data. Fielding (2003a, 2003b) investigates the impact of political instability on saving and investment, respectively, during the period 1987-99. His results show that the savings ratio in Israel would almost double and investment would rise on average by 20% if there were no more politically related deaths in Israel. Eckstein and Tsiddon (2004) conduct a similar analysis on consumption, investment, exports and GDP per capita. They conclude that had Israel not suffered from terrorism over the last three years, its GDP per capita would have been 4 percent higher than its actual level. Perhaps more related to the variables of interest in the current paper, Eldor and Melnick (2004) study the consequences of terrorism on stocks traded at the Tel Aviv Stock Exchange. They find that the Palestinian uprising caused a significant decreased of around 30% on a TASE market index.

In this paper the possibility that the effect of terror might be positive for some industries in the economy even if its overall effect is negative, is allowed.

---

<sup>7</sup> Model (3) and all the subsequent models are estimated, both with and without company's specific fixed effects.

In particular, the expected impact of terror is not constrained to be uniform across companies but rather to depend on the company's main economic activities. For example, it is clear that the effect of terror on tourism is not the same as its effect on companies providing products and services related to the defense sector of the economy.<sup>8</sup>

To account for the effect just described a dummy variable that indicates whether a company is associated with defense, security or anti-terrorism products, services or clients is added in the second part of the econometric analysis. That is, the following model is estimated,

$$(4) \quad DAR_t^j = \gamma_1 + \gamma_2 Ter_t + \gamma_3 Def_i + \gamma_4 Ter_t * Def_i + u_t$$

where  $\gamma_2$  measures the effect of terrorism common to all the companies,  $\gamma_3$  is a defense effect that controls for possible differences in the abnormal returns of companies in the defense sector compared to the rest of the companies, and  $\gamma_4$  is an interaction effect of terrorism on defense related companies.

This model allow to explicitly test any systematic difference in the impact of terrorism on the stocks' returns of defense related companies compared to all the other companies. It also makes it possible to address the question of whether terrorism increases the abnormal returns of Israeli defense related companies compared to the abnormal returns observed in the control group.

---

<sup>8</sup> Fishelson (1993) performs an industry decomposition to study the impact of the first Palestinian uprising (Intifada) on the levels and trends of the various real economic activities in Israel between the years 1987-89. He finds that the Intifada had a statistically significant effect on most economic activities, with the exception of various export related activities. He didn't, however, study the specific effect of violence on the defense related industries.

If the hypothesis is correct, and the effect of terror is not evenly distributed across industries, we should expect  $\gamma_2$  to be negative whereas  $\gamma_4$  should be positive. Moreover, the sum of  $\gamma_2$  and  $\gamma_4$  should be greater than zero if the effects of terrorism on the stock prices of Israeli companies in the defense sector vis-à-vis their American counterparts are positive.

#### 4. Results

Tables 5 and 6 provide parameter estimates for the two models above using different time spans for the level of terrorism. The only difference between the tables is that Table 5 includes all the available stocks whereas Table 6 includes only stocks that are not dually-listed. The results of all the different specifications convey a similar message; namely, terrorism has a positive effect on the stock returns of Israeli companies involved in or with defense, security or anti-terrorism products or clients and a negative effect on the rest of the Israeli companies, regardless of the time frame used to measure the level of terrorism.

Table 5 reports the results of the estimation of equations (3) and (4) by ordinary least squares. In the first two columns terrorism is measured using a dummy variable equal to one from September 28, 2000 and onwards. In columns (3) and (4) terrorism is measured using the number of monthly terrorist attacks; columns (5) and (6) contain the results of the estimation when looking at the weekly number of attacks; finally, the last two columns report the obtained results when looking at the daily number of attacks.<sup>9</sup>

According to all the obtained results, the data show a significant negative relationship between terrorism and abnormal returns of Israeli companies only

---

<sup>9</sup> The time difference between Israel and the US creates a problem when using daily attacks. Attacks perpetrated before the closing of the stock markets might show an effect on the same day, whereas the effects of attacks perpetrated after the closing of the stock market are captured the next trading day. Weekends and holidays create the same concern. The same empirical analysis was conducted with the inclusion of lags of the daily attacks in order to account for the possibility described above. The results, available from the author upon request, are basically the same.

when the defense effect and the interaction effect are included in the estimation. In other words, as terrorism has a negative effect on some sectors of the economy and positive effects on other sectors, pooling them together misrepresents the overall effect of terrorism. Moreover, if the positive and negative effects cancel each other out one may reach the wrong conclusion; that is, that terrorism has not a significant impact on the abnormal returns of Israeli companies relative to their counterparts.

The terrorism effect shown in column (2) indicates that over 5% of the decrease in the valuation of an Israeli company not related to the defense industry can be explained by the Palestinian uprising that started in September 2000. Columns (4), (6) and (8) provide additional estimates of the impact of an increase in the level of attacks on the abnormal returns of a non-defense-related Israeli company. These effects vary from 0.7% to 2% depending on whether attacks are measured using monthly, weekly or daily data. The effect of monthly attacks is significant at statistically accepted levels, whereas the effect of weekly attacks is only marginally significant (at the 12% level).<sup>10</sup>

The defense effect estimated in the even columns is not significant on a consistent basis. This suggests that the behavior of the relative abnormal return

---

<sup>10</sup> Daily attacks are not significant in any of the estimated models, even when lags of this variable are included. It is not clear, however, what is the minimum time needed for information regarding terrorist attacks in Israel to be publicly available in a reliable way internationally. Given the issues involved with daily data described above, I am reluctant to conclude that markets are not efficient. Eldor and Melnick (2004) specifically test and conclude that the TASE is efficient since the value of stocks immediately reflects the impact of terrorist attacks.

of Israeli defense related companies is not significantly different from the one exhibited by the remaining companies. The fact that also the intercept is not statistically significant for any of the different specifications implies that there is not an "Israeli effect" on the abnormal returns of the companies.<sup>11</sup>

Terrorism is, according to the results of the estimation, what influences the abnormal return of companies in the defense sector differently from the rest of the companies. The estimates indicate that the abnormal returns of Israeli defense related companies increased by over 7% relative to their American counterparts as a consequence of the Palestinian uprising. The evidence regarding the overall effect of terrorism on defense related Israeli companies in shorter time spans is also significantly positive: an effect in the order of 1% to 2.5% is obtained using monthly and weekly data respectively.<sup>12</sup>

As mentioned above, the fact that several of the Israeli companies are traded simultaneously at the Tel Aviv Stock Exchange and at one of the American markets considered to build the data set could potentially cause a bias in the results. Table 6 addresses this issue by showing the results of the analysis when the sample is restricted to Israeli companies that traded exclusively at American markets.

The results obtained using this different data set are essentially identical to the ones observed using the full sample. Namely, the observed effect of

---

<sup>11</sup> The fact that the intercept is not significant doesn't mean that they may not be specific fixed effects for each company. Table 7 addresses this alternative specification using a model with companies fixed effects.

<sup>12</sup> The hypothesis that  $\gamma_2 + \gamma_4 = 0$  is rejected at the 10% significant level for all the specifications except the one using daily terrorist attacks.

terrorism on abnormal stock returns is still insignificant when no differentiation is made across industries. Moreover, once the interaction variable for the defense sector is introduced, terror attacks shows a significantly negative effect on Israeli companies overall, and a positive effect on defense related companies. From the table follows that the positive impact of terrorism on the defense sector is higher than the one observed when the full sample was used. In particular, once companies that are dually listed are excluded from the sample the observed effect of terror on the defense sector is roughly one standard deviation higher than the one obtained before, regardless of the time frame used to proxy for terrorism. Moreover, the overall effect of terrorism on the defense sector ( $\gamma_2 + \gamma_4$ ) is also higher under this restricted sample and it is significantly positive for all the specifications at the 5% significant level.

Table 7 provides estimates for equations (3) and (4) including companies' fixed effects. The results are basically the same to the ones obtained without including fixed effects. Moreover, an F-test of the null hypothesis that all pairs of counterparts' specific fixed effects are equal to zero cannot be rejected at the 99% level. This provides empirical support to the propensity matching procedure carried on to build the control group, as each company particular characteristics seem to cancel out with the particular characteristics of its counterpart; that is, the results of the F-test corroborate that the behavior of the relative abnormal returns of every pair of counterparts is not significantly different from the one observed in the rest of the pairs, once the level of terrorism and whether or not these companies belong to the defense industry are controlled for.



## 5. Conclusions

This paper empirically assessed the impact of terrorism on the stock values of Israeli companies that traded in American markets. The main contribution of this paper was to show that the impact of terrorism is not uniform across companies belonging to different industries. Overall, the obtained evidence strongly suggests that terrorism has a positive impact on the stock valuation of companies involved in or with defense, security or anti-terrorism products or clients, whereas the effect of terrorism on the rest of the companies is significantly negative.

This paper provides an initial step towards a better understanding of the differential impact of terrorism on different economic activities. The important economic ramifications of studies along these lines cannot be overstated in a world where proliferation of terrorism has reached unexpected levels. As an example, I conjecture that the differing effects of terrorism across industries should lead to a reallocation of resources in countries that expect to suffer long periods of violence in the future. I hope to be able to assess this empirical conjecture in the near future.

## 6. References

- Abadie, Alberto and Gardeazabal, Javier. "The Economic Costs of Conflict: A Case Study of the Basque Country." *American Economic Review*, 93(1), March 2003, pages 113-132.
- Berrebi, Claude. "Evidence about the Link between Education, Poverty and Terrorism among Palestinians." IRS Working Paper 477, Princeton University, September 2003.
- Campbell, John Y., Lo, Andrew W. and MacKinlay, Archie Craig. *The Econometrics of Financial Markets*. Princeton University Press, Princeton, New Jersey, 1997.
- Dehejia, Rajeev H. and Wahba, Sadek. "Propensity Score Matching Methods for Non-Experimental Casual Studies." *Review of Economics and Statistics*, 84(1), February 2002, pages 151-161.
- Eckstein, Zvi and Tsiddon, Daniel. "Macroeconomic Consequences of Terror: Theory and the Case of Israel." *Journal of Monetary Economics*, 51(5), July 2004, pages 971-1002.
- Eldor, Rafi and Melnick, Rafi. "Financial Markets and Terrorism." *European Journal of Political Economy*, 20(2), June 2004, pages 367-386.
- Fama, Eugene F. and French, Kenneth R. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics*, 33, 1993, pages 3-56.
- Fielding, David. "Counting the Costs of the Intifada: Consumption, Saving and Political Instability in Israel." *Public Choice*, 116(3-4), September 2003a, pages 297-312.

Fielding, David. "Modeling Political Instability and Economic Performance: Israeli Investment during the *Intifada*." *Economica*, 70, February 2003b, pages 159 – 186.

Fishelson, Gideon. "Political Events and Economic Trends: the Effects of the Intifada on the Israeli Economy." Foerder Institute for Economic Research Working Paper 10-93, August 1993, Tel Aviv University.

Lieberman, Offer, Ben-Zion, Uri and Hauser, Shmuel. "A Characterization of the Price Behavior of International Dual Stocks: An Error Correction Approach." *Journal of International Money and Finance*, 18(2), February 1999, pages 289-304.

**Figure 1: Deadly attacks on a monthly basis**

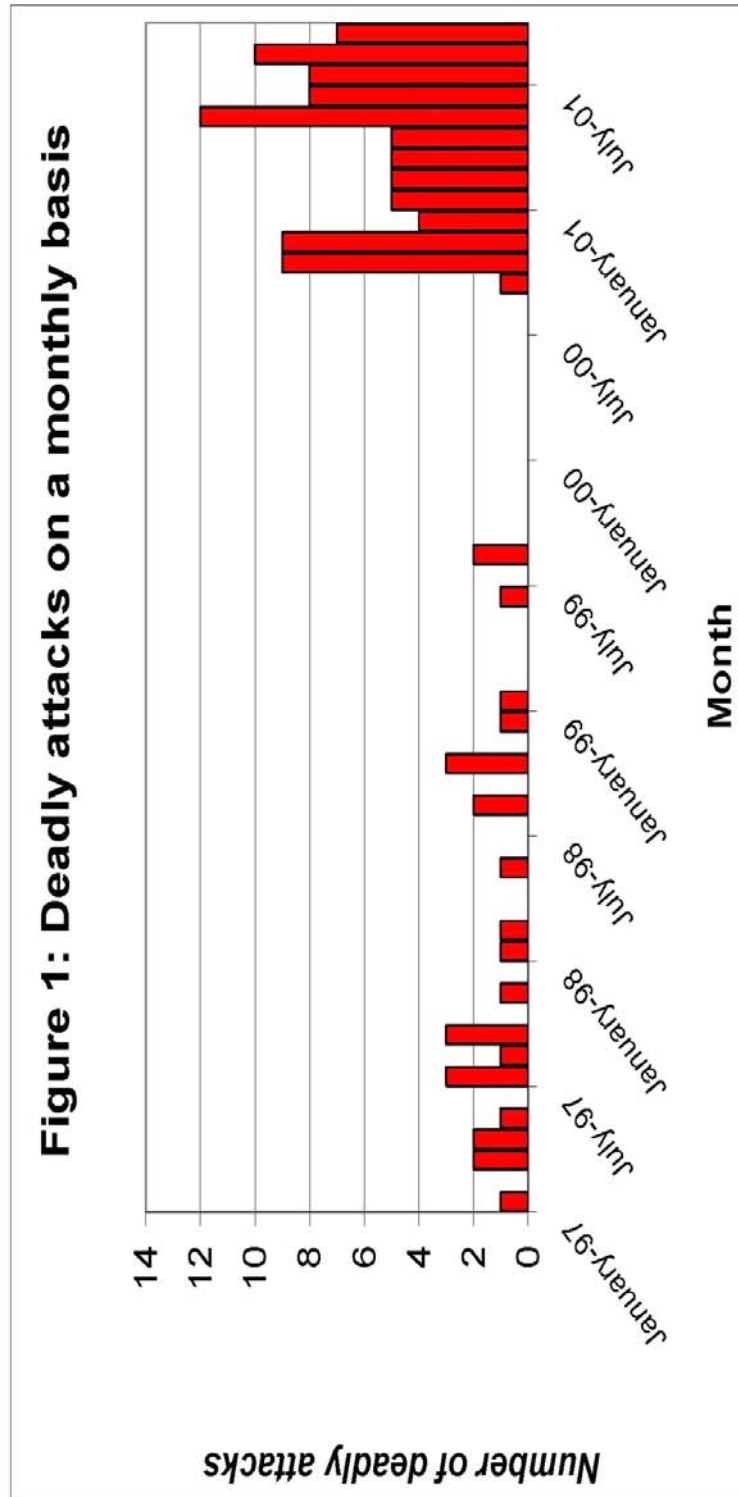


Table 1: List of "Israeli" Stocks Traded at American Markets

ACSEF	ACS-Tech80 Ltd		KERX	Keryx Biopharmaceuticals Inc
ALDN	Aladdin Knowledge Sys Ltd		KOR	Koor Industries Ltd
AIP	American Isreali Paper Mills		LANTF	Lannet Data Communications
ARLC	Arel Communications & Software		LNOP	Lanoptics Ltd
ATTU	Attunity Ltd		LVEL	Level 8 Sys Inc.
AUDC	Audiocodes Ltd		MAGS	Magal Security Sys Ltd
BWEB	Backweb Technologies Ltd		MGIC	Magic Software Enterprises
BTGC	Bio Technology General Corp		MATV	Matav-Cable Sys Media -ADR
BSI	Blue Squre Israel Ltd - ADR		MDSLFL	MEDIS EL Ltd
BOSC	BOS Better Online Solutions		MEMCF	Memoo Software Ltd
BRZE	Breezecom Ltd		MNTE	Mentergy Ltd.
BVRT	BVR Technologies Ltd		MTSL	Mer Telemgmt Solutions Ltd
CAMT	Camtek Ltd		MTLK	Metalink Ltd
KML	Carmel Container Sys -ORD		MNDO	Mind CTI Ltd
CHKP	Check Point Software Techn		FLSH	M-Systems Flash Disk Pioneer
CIMT	Cimatron Ltd		NNDS	NDS Group PLC -SPON ADR
CKSW	Clicksoftware Technologies Ltd		DDDDF	New Dimension Software Ltd
CTCH	Commtouch Software Ltd		NXUS	Nexus Telocation Sys Ltd
CGEN	Compugen Ltd		NICE	Nice Systems Ltd -SPON ADR
CMVT	Comverse Technology Inc		NOGAF	Noga Electro-Mechanical Inds.
CREO	Creo Products Inc.		NVMI	Nova Measuring Instruments Ltd
CRYS	Crystal Systems Solutions Ltd		NURM	Nur Macroprinters Ltd
DSSI	Data Systems & Software Inc.		OBAS	Optibase Ltd
DELT	Delta Galil Inds. Ltd -ADR		OPTL	Optisystems Solutions Ltd
DDDC	Deltathree Inc		ORFR	Orbit/FR Inc
DSPG	DSP Group Inc		ORBK	Orbotech Ltd
ESIM	E Sim Ltd		ORCT	Orckit Communications Ltd
ECIL	Eci Telecommunications -ORD		PGEOL	Paradigm Geophysical Ltd
ECTX	Ectel Ltd		PTNR	Partner Comm. Co Ltd -ADR
EDNTF	Eduentics Ltd		PARS	Pharmos Corp
EDUSF	Edusoft LTD		PLCM	Polycom Inc.
ELOFC	El De Electro-Optic Dev Ltd		PRSE	Precise Software Solutions Ltd
ELBT	Elbit Ltd		RADIF	Rada Electronics Inds
EMITF	Elbit Medical Imaging Ltd		RDCM	Radcom Ltd
ESLT	Elbit Systems Ltd		RVSN	Radvision Ltd
EVSN	Elbit Vision Systems Ltd		RDWR	Radware Ltd
EFCX	Electric Fuel Corp.		RTLX	Retalix Ltd
EIL	Electrochemical Indus Frutar		RITT	RIT Technologies Ltd
EFII	Electronics for Imaging Inc.		ROBO	Robo Group Tek Ltd
ELRN	Elron Electronics Inds -Ord		3RBMXF	Robomatix Tech Ltd
ELT	Elsint Ltd -ORD		SPNS	Sapiens Intl Corp N V
ELTK	Eltek Ltd		SCIX	Scitex Corp. Ltd - ORD
ENGEF	Engel General Developers Ltd		SILCF	Silicom Limited
EQY	Equity One Inc		3SMPL	Simplayer.com Ltd
ESCM	ESC Medical Systems Ltd		SAE	Super Sol Ltd -ADR
ETZ	ETZ Lavud Ltd		TAD	Tadiran Ltd -SPON ADR
FLRE	Floware Wireless Systems Ltd		TTELF	Tadiran Telecommunications Ltd
FORTY	Formula Sys 1985 Ltd		TARO	Taro Pharmaceutical Inds Ltd
FORS	Forsoft Ltd.		TATTF	TAT Technologies Ltd -ORD
FNDT	Fundtech Ltd		TCNO	Tecnomatix Technologies Ltd
WILCF	G Willi-Food Intl Ltd		TFR	Tefron Ltd.
GALT	Galileo Technology Ltd		TLDCF	Teledata Communications Ltd
GILTF	Gilat Satellite Networks Ltd		TERM	Terayon Comm. Systems Inc
HCTL	Healthcare Technologies Ltd		TEVA	Teva Pharm. Inds. -ADR
HOMEF	Home Centers (DIY) Ltd		TIGA	Tioga Technologies Ltd
ICTS	ICTS International N V		TISA	Top Image Systems Ltd
IISL	IIS Intelligent Info -ORD		TSEM	Tower Semiconductor Ltd
INDG	Indigo NV		TTIL	TTI Team Telecom Intl. Ltd
IGLD	Internet Gold -GLDN Lines Ltd.		VRYA	Viryanet Ltd
IPLLF	Interpharm Labs Ltd -ORD		VOCL	Vocaltec Communications Ltd
ISRL	Isramco Inc.		3WIZTF	Wiztec Solutions
ISEFE	Istec Industries & Tech Ltd		ZRAN	Zoran Corp
JCDA	Jacada Ltd			

**Table 2: Final list of stocks with their respective twins**

	Israeli Company Name		Respective Us "Twin" Company	Industry
ACSEF	Acs-Tech80 Ltd	SOFT	Softech Inc	CMP INTEGRATED SYS DESIGN
ARLC	Arel Communications & Sftwre	INGR	Intergraph Corp	CMP INTEGRATED SYS DESIGN
ATTU	Attunity Ltd	TMBS	Timberline Software Corp	PREPACKAGED SOFTWARE
BOSC	Bos Better Online Solutions §	NPIX	Network Peripherals Inc	COMPUTER COMMUNICATION EQUIP
BSI	Blue Square-Israel Ltd -Adr §	WMK	Weis Markets Inc	GROCERY STORES
BTGC	Bio Technology General Corp	CYAN	Cyanotech Corp	MEDICINAL CHEMS,BOTANICL PDS
BVRT	Bvr Technologies Ltd	DKEY	Datakey Inc	MISC ELEC MACHY,EQ,SUPPLIES
CHKP	Check Point Software Techn *	TTWO	Take-Two Interactive Sftwr	PREPACKAGED SOFTWARE
CIMT	Cimatron Ltd	TESI	Tangram Entp Solutions	PREPACKAGED SOFTWARE
CMVT	Comverse Technology Inc *	SYMM	Symmetricom Inc	TELE & TELEGRAPH APPARATUS
DSPG	Dsp Group Inc	ADAP	Adaptive Broadband Corp	RADIO,TV BROADCAST, COMM EQ
DSSI	Data Systems & Software Inc	ANLY	Analysts International Corp	COMPUTER PROGRAMMING SERVICE
ECIL	Eci Telecommunications -Ord *	ASPT	Aspect Communications Corp	TELE & TELEGRAPH APPARATUS
EFCX	Electric Fuel Corp *	CARD	Publicard Inc	MISC ELEC MACHY,EQ,SUPPLIES
EFII	Electronics For Imaging Inc	ESAN	Entrada Networks Inc	COMPUTER COMMUNICATION EQUIP
ELT	Elscent Ltd -Ord	VAR	Varian Medical Sytems Inc	ELECTROMEDICAL APPARATUS
ELTK	Elttek Ltd *	SGMA	Sigmatron International Inc	PRINTED CIRCUIT BOARDS
ESLT	Elbit Systems Ltd § **	COMS	3com Corp	CMP INTEGRATED SYS DESIGN
ETZ	Etz Lavud Ltd	II	Intersystems Inc/De	MISC PLASTICS PRODUCTS
EVSN	Elbit Vision Systems Ltd	SOFT	Softech Inc	CMP INTEGRATED SYS DESIGN
FLSH	M-Systems Flash Disk Pioneer	MTIC	Mti Technology Corp	COMPUTER STORAGE DEVICES
FORTY	Formula Sys 1985 Ltd -Adr § **	QSII	Quality Systems Inc	CMP INTEGRATED SYS DESIGN
GALT	Galileo Technology Ltd	LOGC	Logic Devices Inc	SEMICONDUCTOR,RELATED DEVICE
GILTF	Gilat Satellite Networks Ltd *	WRLS	Telular Corp	RADIO,TV BROADCAST, COMM EQ
HCTL	Healthcare Technologies Ltd	MABA	Amer Biogenetic Sci -Cl A	IN VITRO,IN VIVO DIAGNOSTICS
HOMEF	Home Centers (Diy) Ltd §	FAST	Fastenal Co	BLDG MATL,HARDWR,GARDEN-RETL
ICTS	Icts International N V *	TTEC	Teletech Holdings Inc	BUSINESS SERVICES, NEC
IISL	Iis Intelligent Info -Ord	NCDI	Network Computing Devices	COMPUTER TERMINALS
INDG	Indigo N V	CTCQ	Check Technology Corp	PRINTING TRADES MACHY, EQUIP
ISRL	Isramco Inc	CRED	Credo Petroleum Corp	CRUDE PETROLEUM & NATURAL GS
KOR	Koor Industries Ltd -Adr § **	SXI	Standex International Corp	CONGLOMERATES
LNOP	Lanoptics Ltd	CPCI	Ciprico Inc	COMPUTER COMMUNICATION EQUIP
LVEL	Level 8 Sys Inc	CVNS	Covansys Corp	COMPUTER PROGRAMMING SERVICE
MAGS	Magal Security Sys Ltd § **	NMRX	Numerex Corp -Cl A	COMMUNICATIONS EQUIP, NEC
MATV	Matav-Cable Sys Media -Adr	CMCSK	Comeast Corp -Cl A Spl	CABLE AND OTHER PAY TV SVCS
MGIC	Magic Software Enterprises *	EDGW	Edgewater Technology Inc	PREPACKAGED SOFTWARE
MNTE	Mentergy Ltd	EPRE	Epresence Inc	CMP PROGRAMMING,DATA PROCESS
MTSL	Mer Telemgmt Solutions Ltd	SIDY	Science Dynamics Corp	TELE & TELEGRAPH APPARATUS
NICE	Nice Systems Ltd -Spon Adr *	CIEN	Ciena Corp	TELE & TELEGRAPH APPARATUS
NOGAF	Noga Electro-Mechanical Inds	ABTE	Able Telcom Holding Corp	ELECTRICAL WORK
NURM	Nur Macroprinters Ltd	PRST	Presstek Inc	PRINTING TRADES MACHY, EQUIP
NXUS	Nexus Telocation Sys Ltd *	STCIA	Salient 3 Commun Inc -Cl A	RADIO,TV BROADCAST, COMM EQ
ORBK	Orbotech Ltd	CGNX	Cognex Corp	INDUSTRIAL MEASUREMENT INSTR
ORCT	Orckit Communications Ltd § **	PCTL	Picturatel Corp	TELE & TELEGRAPH APPARATUS
ORFR	Orbit/Fr Inc *	TLGD	Tollgrade Communications Inc	ELEC MEAS & TEST INSTRUMENTS
PARS	Pharmos Corp *	BSTC	Biospecifics Technologies Cp	PHARMACEUTICAL PREPARATIONS
PLCM	Polycom Inc § **	AFCI	Advanced Fibre Comm Inc	TELE & TELEGRAPH APPARATUS
RADIF	Rada Electronic Inds *	KVHI	Kvh Industries Inc	SRCH,DET,NAV,GUID,AERO SYS

Table 2 – Continuation

RDCM	Radcom Ltd	CPCI	Ciprico Inc	COMPUTER COMMUNICATION EQUIP
RITT	Rit Technologies Ltd	CPCI	Ciprico Inc	COMPUTER COMMUNICATION EQUIP
ROBO	Robo Group Tek Ltd §	IMCI	Infinite Group Inc	MISC ELEC MACHY, EQ, SUPPLIES
SAE	Super-Sol Ltd -Adr §	SMF	Smart & Final Inc	GROCERY STORES
SCIX	Scitex Corp Ltd -Ord §	PRST	Presstek Inc	PRINTING TRADES MACHY, EQUIP
SILCF	Silicom Limited	AESP	Advanced Electr Support Pds	COMPUTER COMMUNICATION EQUIP
SPNS	Sapiens Intl Corp N V §	PTEC	Phoenix Technologies Ltd	PREPACKAGED SOFTWARE
TARO	Taro Pharmaceutical Inds Ltd	BLSI	Boston Life Sciences Inc	PHARMACEUTICAL PREPARATIONS
TATTF	Tat Technologies Ltd -Ord *	KRSL	Kreisler Manufacturing Corp	AIRCRAFT ENGINE, ENGINE PARTS
TCNO	Tecnomatix Technologies Ltd	IMIC	Indusri-Matematik Intl Corp	PREPACKAGED SOFTWARE
TEVA	Teva Pharm Inds -Adr §	VPHM	Viropharma Inc	PHARMACEUTICAL PREPARATIONS
TISA	Top Image Systems Ltd *	QMDC	Quadramed Corp	PREPACKAGED SOFTWARE
TSEM	Tower Semiconductor Ltd §*	OPTI	Opti Inc	SEMICONDUCTOR, RELATED DEVICE
TTIL	Tti Team Telecom Intl Ltd	DRCO	Dynamics Research Corp	CMP INTEGRATED SYS DESIGN
VOCL	Vocaltec Communications Ltd **	EGPT	Eagle Point Software Corp	PREPACKAGED SOFTWARE
WILCF	G Willi-Food Intl Ltd	PZZI	Pizza Inn Inc/Mo	GROCERIES & RELATED PDS-WHSL
ZRAN	Zoran Corp	ISSI	Integrated Silicon Solution	SEMICONDUCTOR, RELATED DEVICE

§ Arbitrage Stocks

\* Defense related companies

Table 3: Stock's summary statistic

Variable:		Israeli firms involved in or with defense or security related businesses, products or clients												Other firms								
		Israeli firms				Respective twins				Difference				Israeli firms			Respective twins			Difference		
		Ri	ARi	Ri	ARi	Ri	ARi	DARI	Ri	ARi	DARI	Ri	ARi	DARI	Ri	ARi	DARI	Ri	ARi	DARI		
Entire Period	Mean	0.001	-0.054	0.002	-0.052	-0.003	0.001	-0.059	0.002	-0.055	0.001	-0.059	0.002	-0.055	0.002	-0.055	0.002	-0.055	-0.002			
	STD	0.063	1.741	0.065	1.705	1.127	0.079	1.680	0.070	1.692	0.079	1.680	0.070	1.692	0.070	1.692	0.070	1.692	1.044			
	Max	1.727	13.757	2.556	21.579	8.894	7.7	22.464	2.175	12.958	7.7	22.464	2.175	12.958	2.175	12.958	2.175	12.958	10.586			
	Min	-0.611	-11.234	-0.800	-18.408	-8.374	-1	-19.570	-1	-13.540	-1	-19.570	-1	-13.540	-1	-13.540	-1	-13.540	-10.767			
1.1.98 to 9.10.01	Obs.	16813	16813	16569	16569	16569	30316	30316	30316	29761	30316	30316	29761	29761	29761	29761	29761	29761	29418			
	Mean	0.002	-0.081	0.003	-0.069	-0.012	0.003	-0.075	0.002	-0.078	0.003	-0.075	0.002	-0.078	0.002	-0.078	0.002	-0.078	0.005			
	STD	0.061	1.621	0.065	1.582	1.042	0.083	1.573	0.068	1.563	0.083	1.573	0.068	1.563	0.068	1.563	0.068	1.563	0.946			
	Max	1.727	13.757	2.556	21.579	7.642	7.7	22.464	2.175	12.958	7.7	22.464	2.175	12.958	2.175	12.958	2.175	12.958	9.614			
Pre Uprising 1.1.98 to 9.28.00	Min	-0.496	-11.107	-0.800	-13.849	-8.374	-0.590	-16.097	-1	-11.332	-0.590	-16.097	-1	-11.332	-1	-11.332	-1	-11.332	-9.946			
	Obs.	12512	12512	12319	12319	12319	22835	22835	22435	22435	22835	22835	22435	22435	22435	22435	22435	22435	22422			
	Mean	-0.002	0.039	0.001	0.012	0.027	-0.002	0.004	-0.000	0.033	-0.002	0.004	-0.000	0.033	-0.000	0.033	-0.000	0.033	-0.025			
	STD	0.068	2.043	0.065	2.012	1.341	0.066	1.962	0.076	2.027	0.066	1.962	0.076	2.027	0.076	2.027	0.076	2.027	1.308			
Post Uprising 9.28.00 to 9.11.01	Max	1.473	8.120	0.602	12.666	8.894	0.762	13.676	1.25	9.567	0.762	13.676	1.25	9.567	1.25	9.567	1.25	9.567	10.586			
	Min	-0.611	-11.234	-0.414	-18.408	-7.888	-1	-19.571	-0.5	-13.540	-1	-19.571	-0.5	-13.540	-0.5	-13.540	-0.5	-13.540	-10.767			
	Obs.	4278	4278	4227	4227	4227	7439	7439	7284	7284	7439	7439	7284	7284	7284	7284	7284	7284	6954			
	Mean	0.002	-0.081	0.003	-0.069	-0.012	0.003	-0.075	0.002	-0.078	0.003	-0.075	0.002	-0.078	0.002	-0.078	0.002	-0.078	0.005			



Table 4: Terrorism Summary Statistics

	Terrorist Attacks: From January 1, 1998 To September 10, 2001	Terrorist Attacks: From January 1, 1998 To September 28, 2000	Terrorist Attacks: From September 29, 2000 To September 10, 2001
Daily Average	0.0719	0.0140	0.2392
Daily STD	0.3009	0.1174	0.5244
Daily Max	2	1	2
Daily Min	0	0	0
No. of Days	1349	1002	347
Weekly*** Average	0.5026	0.0909	1.68
Weekly*** STD	1.0161	0.2885	1.3768
Weekly*** Max	5	1	5
Weekly*** Min	0	0	0
No. of Weeks	193	143	50
Monthly** Average	2.2444	0.4242	7.25
Monthly** STD	3.3585	0.7513	2.4909
Monthly** Max	12	3	12
Monthly** Min	0	0	4
No. of Months	45	33	12
Yearly* Average	30.25	6.5	54
Yearly* STD	37.3753	3.5355	43.8406
Yearly* Max	85	9	85
Yearly* Min	4	4	23
No. of Years	4	2	2
<b>TOTAL</b>	<b>97</b>	<b>14</b>	<b>83</b>

\* Yearly data ending in 2001 include the entire year 2001; the entire year 2000 is included in the yearly statistics beginning in September 29, 2000 (2000 is omitted from the yearly statistics ending September 28, 2000).

\*\* Monthly data ending in 2001 include the entire month of September 2001; September 2000 is entirely omitted from the monthly statistics beginning in September 29, 2000 (September 2000 was included in the monthly statistics ending September 28, 2000).

\*\*\* Weekly data ending in 2001 include the entire week of September 9, 2001; the entire week of September 24, 2000 is included in the weekly statistics ending on September 2000 (this week is omitted from the statistics beginning in September 29, 2000); Weeks start on Sunday and end on Saturday.

Table 5: The Effects of Terrorist Attacks on the Value of Stocks (includes all the available companies)  
 Dependent Variable: Difference between the abnormal return of every Israeli company and its respective counterpart,  $DA\hat{R}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.0023 (0.0105)	0.0098 (0.0126)	-0.0034 (0.0111)	0.0117 (0.0133)	-0.0028 (0.0105)	0.0054 (0.0127)	-0.0039 (0.0102)	-0.0025 (0.0124)
Defense		-0.0343 (0.0226)		-0.0419* (0.0237)		-0.0230 (0.0226)		-0.0040 (0.0218)
Uprising	-0.0077 (0.0271)	-0.0556* (0.0338)						
Def*Uprising		0.1288** (0.0565)						
Monthly Attacks			-0.0004 (0.0032)	-0.0075** (0.0040)				
Def*MonthlyAt.				0.0189*** (0.0067)				
Weekly Attacks					-0.0030 (0.0103)	-0.0196 (0.0129)		
Def*WeeklyAt.						0.0444** (0.0215)		
Daily Attacks							-0.0045 (0.0380)	-0.0139 (0.0478)
Def*DailyAt								0.0251 (0.0789)
Obs	45987	45987	45987	45987	45987	45987	45987	45987

Notes: Heteroskedasticity-robust standard errors are in parentheses. Sample period: January 1, 1998 – September 10, 2001.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.

Table 6: The Effects of Terrorist Attacks on the Value of Stocks (includes only companies that are not dually-listed)  
 Dependent Variable: Difference between the abnormal return of every Israeli company and its respective counterpart,  $DA\hat{R}$

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	-0.0041 (0.0124)	0.0106 (0.0146)	-0.0062 (0.0130)	0.0119 (0.0154)	-0.0064 (0.0125)	0.0024 (0.0148)	-0.0061 (0.0121)	-0.0053 (0.0145)
Defense		-0.0458* (0.0273)		-0.0555** (0.0287)		-0.0271 (0.0273)		-0.0022 (0.0264)
Uprising	-0.0080 (0.0324)	-0.0696* (0.0400)						
Def*Uprising		0.1832*** (0.0683)						
Monthly Attacks			0.0001 (0.0039)	-0.0089* (0.0048)				
Def*MonthlyAt.				0.0265*** (0.0081)				
Weekly Attacks					0.0007 (0.0124)	-0.0188 (0.0153)		
Def*WeeklyAt.						0.0575*** (0.0259)		
Daily Attacks							0.0005 (0.0457)	-0.0102 (0.0569)
Def*DAILYAt								0.0313 (0.0956)
Obs	35183	35183	35183	35183	35183	35183	35183	35183

Notes: Heteroskedasticity-robust standard errors are in parentheses. Sample period: January 1, 1998 – September 10, 2001.

\*\*\* Significant at the 1% level.

\*\* Significant at the 5% level.

\* Significant at the 10% level.

**Table 7: The Effects of Terrorist Attacks on the Value of Stocks (Includes Companies Fixed Effects)**  
**Dependent Variable:** Difference between the abnormal return of every Israeli company and its respective counterpart,  $DAR$

	All Stocks			Non Arbitrage Stocks				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Defense	-0.1161* (0.0689)	-0.0622 (0.0970)	-0.0524 (0.0971)	-0.0436 (0.0972)	-0.0660 (0.0966)	-0.1371** (0.0696)	-0.1136* (0.0684)	-0.0441 (0.0973)
Uprising	-0.0533 (0.0336)				-0.0664* (0.0398)			
Def*Uprising	0.1276** (0.0565)				0.1816*** (0.0684)			
Monthly Attacks		-0.0072* (0.0040)				-0.0085* (0.0047)		
Def*MonthlyAt.		0.0188*** (0.0067)				0.0262*** (0.0081)		
Weekly Attacks			-0.0188 (0.0128)				-0.0176 (0.0152)	
Def*WeeklyAt.			0.0438** (0.0215)				0.0566** (0.0259)	
Daily Attacks				-0.0122 (0.0479)				-0.0078 (0.0569)
Def*DAILYAt				0.0236 (0.0790)				0.0291 (0.0957)
F-test	0.41	0.41	0.39	0.39	0.41	0.42	0.38	0.39
	1.0000	1.0000	1.0000	1.0000	0.9999	0.9999	1.0000	1.0000
Obs	45987	45987	45987	45987	35183	35183	35183	35183

Notes: Heteroskedasticity-robust standard errors are in parentheses. Sample period: January 1, 1998 – September 10, 2001.  
 F-test is an F test of the null hypothesis that all pair of twins specific fixed effects in the FE-specification are equal to zero, with p-values reported in brackets.  
 \*\*\* Significant at the 1% level.  
 \*\* Significant at the 5% level.  
 \* Significant at the 10% level.