

Preliminary
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Terrorism, Tears, and Trade*

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Abstract

In recent years, terrorism has become much more violent; the number of injuries and fatalities per terrorist incident has increased sizably. In this paper, I examine the effect of international terrorism on bilateral trade flows. Using a gravity model of trade, I analyze trade between more than 180 countries over the period from 1968 to 2003. I find that terrorism tends to reduce trade, with particularly strong effects for violent and more frequent attacks. Terrorism generally hurts exports and appears to benefit imports. On average, trade is lower for two years after an attack.

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I. Introduction

Terrorism has become increasingly violent in recent years. From 1999 to 2003, more than 8,000 persons were wounded in a terrorist attack, up from a total of about 4,000 a decade earlier. Even more dramatically, the number of persons killed in a terrorist incident has tripled over the same period; more than 4,600 persons have recently lost their life in an act of international terrorism. Since the overall number of terrorist incidents has declined sharply, in contrast, the average incident has become much more costly in terms of human suffering and threat to life.¹

As Table 1 shows, this growing violence of terrorism is not a particularly new phenomenon; the number of injuries and fatalities per incident has gradually increased over time at least since the late 1960s. Still, the latest move towards targeting humans appears to be completely unprecedented both in absolute magnitude and its rate of change.² Moreover, Figure 1 illustrates that this shift is not exclusively driven by a few incidents causing mass casualties. While yearly data shows high variation in terrorist activity, there has been a general tendency towards more violent, life-threatening attacks.

The changing nature of terrorism has led to growing interest in the possible effects of terrorism. While it is well known that violence and riots generally harm the economy, the effects of terrorism on economic activity are a priori unclear. On the one hand, the direct impact of most terrorist attacks appears to be relatively small. Terrorist incidents are often isolated events, without having a long-lasting impact. Sometimes terrorists target particular (key) industries of a country. However, the physical damage caused by these attacks is often very limited. On the other hand, terrorism aims to increase uncertainty and thereby

¹ The U.S. Department of State provides a list of significant terrorist incidents from 1961 to 2003 at <http://www.state.gov/r/pa/ho/pubs/fs/5902.htm>.

² Another interesting detail is that a smaller number of countries were recently attacked by terrorists so that international terrorism has apparently become more geographically concentrated.

undermines internal stability. Growing risk and fear, however, may also change economic behavior. At a minimum, terrorism increases costs for security.

In this short note, I investigate the effect of terrorism on international trade. Previous research indicates that terrorism has negative effects on international trade flows.

Walkenhorst and Dihel (2002) provide a detailed description of trade disruptions after 11 September 2001. Nitsch and Schumacher (2004) use a standard gravity model to examine the effects of terrorism from 1968 to 1979; they estimate that a doubling in the number of terrorist incidents is associated with a decrease in bilateral trade by about 4 percent.

In this paper, I explore a new data set of international terrorism activity. More specifically, I use information on terrorist incidents from the MIPT terrorism databank. This databank provides detailed (and comprehensive) information on terrorist incidents around the world since 1968. Most notably, the databank contains information on the number of persons wounded or killed in an attack.

I find that terrorism generally tends to inhibit trade, with more violent attacks having on average larger (negative) effects on trade. However, there is a strong asymmetry in the trade effects between exporters and importers; terrorism strongly and significantly reduces exports, while imports tend to be disproportionately large in the year of an attack. Interestingly, I find no separate effect for the terrorist activities of Al Qaeda on trade.

The remainder of the paper is organized as follows. The next section describes the empirical methodology and the data. Section 3 presents the results, and Section 4 briefly summarizes the main findings.

II. Methodology and data

In order to identify the effect of terrorism on trade, I use a conventional gravity model of bilateral trade. This model successfully links the value of bilateral exports to the economic size of the two trading partners (typically proxied by their population and income) and the

bilateral distance between them (proxied by geographic distance and other factors that possibly reflect transaction costs); economic mass is positively associated with trade, while greater distance leads to lower trade.

Though widely used in the literature in various forms, the actual empirical implementation of the gravity framework is often of great importance for the results. As recently (again) emphasized by Anderson and van Wincoop (2003), a theory-consistent specification of the gravity model requires that not only bilateral barriers to trade are taken into account but also the relative barriers to trade to all other countries in the sample. A possible (and widely preferred) solution to deal with this problem is the additional inclusion of time-varying country-specific fixed effects. However, since my measures of terrorism activity are perfectly collinear with these control variables, I use a specification that includes time-varying country pair-specific fixed effects.

More specifically, I estimate an equation of the form:

$$(1) \quad \ln(X_{ijt}) = \alpha + \beta \text{ Terror}_{ijt} + \sum_h \gamma^h Z^h_{ijt} + \sum_{k \times t} \delta_{kt} P_{kt} + \varepsilon_{ijt}$$

where X_{ijt} denotes exports from country i to country j at time t ; *Terror* is a measure of terrorist activity; Z is a set of control variables that have the potential to affect trade (mainly borrowed from the gravity literature); P is a comprehensive set of time-varying country pair-specific fixed effects; and ε is a (hopefully) well-behaved residual. The parameter of interest to me is the coefficient β ; this parameter captures the extent to which pair-wise trade is affected by terrorist incidents.

My main source of data is the National Memorial Institute for the Prevention of Terrorism (MIPT) Terrorism Knowledge Base.³ This database integrates data from various sources, most notably the Terrorism Chronology compiled by the RAND Corporation; the

³ The database is accessible online at <http://www.tkb.org>.

database covers the history, affiliations, locations, and tactics of terrorist groups operating across the world, listing in detail all terrorist incidents since 1968. While the dataset is, in principle, proprietary, it is possible to compile (by hand) a complete dataset from the system. In particular, I have extracted, for each country and year, information on the number of terrorist incidents, the number of injuries and the number of fatalities. Table 1 describes the data.⁴

Other data are taken from standard sources. Exports are from the International Monetary Fund's Direction of Trade Statistics; population and income are from the World Bank's World Development Indicators. Data for other controls are borrowed from Rose (2004).

III. Empirical results

Table 1 presents the benchmark results. In line with previous findings, the gravity model works reasonably well in describing the pattern of trade. More specifically, both the exporter's and the importer's population and income enter the regression positively; the negative effect of geographic distance on trade is captured by the (unreported) pair-specific fixed effects.

⁴ Terrorism is defined as "violence, or the threat of violence, calculated to create an atmosphere of fear and alarm. These acts are designed to coerce others into actions they would not otherwise undertake, or refrain from actions they desired to take. [...] This violence or threat of violence is generally directed against civilian targets. The motives of all terrorists are political, and terrorist actions are generally carried out in a way that will achieve maximum publicity. Unlike other criminal acts, terrorists often claim credit for their acts. Finally, terrorist acts are intended to produce effects beyond the immediate physical damage of the cause, having long-term psychological repercussions on a particular target audience. The fear created by terrorists may be intended to cause people to exaggerate the strengths of the terrorist and the importance of the cause, to provoke governmental overreaction, to discourage dissent, or simply to intimidate and thereby enforce compliance with their demands." (<http://www.tkb.org/RandSummary.jsp?page=about>)

Turning to the variable of interest, I experiment with various measures of terrorist activity. I begin with a dummy variable that takes the value of one if there is a terrorist incident in one of the two countries of a pair in a particular year and zero otherwise. This is a standard approach to identify the effects of terrorism on trade; it has been recently applied, among others, by Blomberg and Hess (2005). As shown in the first column, the coefficient is close to zero and statistically insignificant. Next, I perform a simple check to explore the relevance of violence in terrorist activity. More specifically, I modify the dummy variable so that it takes the value one only if the terrorist incident has caused injuries. The results are clearly supportive for the hypothesis that the violence of terrorist attacks matters for the effect on trade; the estimated β coefficient is negative and statistically highly significant. The point estimate of -0.02 implies that trade is lower by about 2 percent for countries and years in which persons were wounded in a terrorist incident. The estimate of β is slightly smaller and just misses statistical significance at conventional levels of confidence (though still economically meaningful) for incidents when people were killed. Finally, the last column of Table 1 reports the results when all three dummies were jointly entered in the regression. The main findings turn out to be robust: terrorism itself has no measurable effect on trade; violent attacks, however, clearly reduce trade.

Table 2 performs another test whether the intensity of terrorist attacks affects trade. Instead of a dummy variable, I enter the (log) number of incidents, injuries and fatalities in the pair. As shown, the results are not particularly convincing; most of the point estimates are not statistically different from zero. There is some evidence, however, that the number of terrorist incidents is negatively associated with trade; more frequent attacks significantly lower trade.

Next, I allow for different effects of terrorism in the exporting and importing country. Estimated coefficients of the key variables are tabulated in Table 4. The results are striking. There is a clear negative effect of terrorism on the side of the exporter; this effect is

consistently observed for all terrorism measures, and increases in magnitude for more violent and more frequent attacks. Similarly, terrorism appears to be positively associated with trade in the importing country. Again, the effect is strong and fairly consistent across different measures of terrorist activity. An intuitive explanation for this finding is that due to physical damages domestic production is substituted by imports. Alternatively, imports are less sensitive and therefore are reduced only with a time lag, a hypothesis to which I turn next.

To examine the time pattern of the effect of terrorism on trade, I add a set of lagged variables; these dummies take the value of one if there has been a terrorist incident in a pair one year ago, two years ago, and so on. Figure 2 plots the estimated coefficients, thereby illustrating the evolution of trade after a terrorist incident. There is clear evidence of a reduction in bilateral trade after a country was hit by a terrorist attack. This reduction in trade lasts for the next two years, with more violent attacks having on average larger and more persistent effects. The effect is particularly pronounced for exporters. For importers, the effect is essentially zero, except that imports appear to be significantly higher in years in which a terrorist incident occurs.

Finally, I explore whether attacks by a particularly violent terrorist grouping, Al Qaeda, have a measurably different effect on trade. Table 5 reports the results. While incidents with injuries and fatalities generally have a negative effect on trade, the point estimate on the Al Qaeda dummy turns out to be significantly positive. This finding indicates that Al Qaeda attacks have, if anything, a less than proportional effect on trade.

IV. Conclusion

In recent years, terrorism has become much more violent; the number of injuries and fatalities per terrorist incident has increased sizably. In this paper, I examine the effect of international terrorism on bilateral trade flows. Using a gravity model of trade, I analyze trade between more than 180 countries over the period from 1968 to 2003. I find that terrorism

tends to reduce trade, with particularly strong effects for violent and more frequent attacks.

Terrorism generally hurts exports and appears to benefit imports. On average, trade is lower for two years after an attack.

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Table 1: Description of the terrorism data

Period	Terrorist incidents		Terrorist incidents with injuries			Terrorist incidents with fatalities		
	Number incidents	Number countries affected	Number injured persons	Number countries affected	Injured per incident	Number killed persons	Number countries affected	Fatalities per incident
1969-73	826	75	626	36	0.76	393	39	0.48
1974-78	1246	90	2058	49	1.65	1049	58	0.84
1979-83	1478	94	4091	56	2.77	1542	59	1.04
1984-88	1941	93	6021	63	3.10	2378	65	1.23
1989-93	1633	111	4290	69	2.63	1363	71	0.83
1994-98	1160	106	16438	71	14.17	2091	70	1.80
1999-03	903	85	8089	41	8.96	4617	41	5.11

Notes: Raw data obtained from the MIPT database.

Table 2: Benchmark results

Terrorist incident	0.001 (0.007)			0.012 (0.008)
Terrorist incident with injuries		-0.020** (0.008)		-0.022* (0.009)
Terrorist incident with fatalities			-0.012 (0.008)	-0.007 (0.009)
Log exporter population	1.191** (0.025)	1.194** (0.025)	1.192** (0.025)	1.193** (0.025)
Log importer population	0.983** (0.025)	0.987** (0.025)	0.985** (0.025)	0.986** (0.025)
Log exporter GDP p/c	0.463** (0.009)	0.463** (0.009)	0.463** (0.009)	0.463** (0.009)
Log importer GDP p/c	0.328** (0.009)	0.328** (0.009)	0.328** (0.009)	0.328** (0.009)
Current colony	-0.592 (0.468)	-0.591 (0.468)	-0.594 (0.468)	-0.591 (0.468)
Currency union	0.042 (0.102)	0.042 (0.102)	0.042 (0.102)	0.042 (0.102)
Regional free trade area	0.255 (0.179)	0.251 (0.179)	0.253 (0.179)	0.251 (0.179)
R2 within	0.05	0.05	0.05	0.05
R2 between	0.52	0.52	0.52	0.52
R2 overall	0.38	0.38	0.38	0.38

Notes: Number of observations = 554,150.

Table 3: Does violence matter?

Log number of terrorist incidents	-0.008 (0.005)			-0.013* (0.006)
Log number of injured in terrorist incidents		0.001 (0.003)		0.001 (0.004)
Log number of fatalities in terrorist incidents			0.004 (0.003)	0.007 (0.005)
Log exporter population	1.193** (0.025)	1.190** (0.025)	1.190** (0.025)	1.192** (0.025)
Log importer population	0.985** (0.025)	0.983** (0.025)	0.982** (0.025)	0.984** (0.025)
Log exporter GDP p/c	0.463** (0.009)	0.463** (0.009)	0.463** (0.009)	0.462** (0.009)
Log importer GDP p/c	0.327** (0.009)	0.328** (0.009)	0.328** (0.009)	0.327** (0.009)
Current colony	-0.595 (0.468)	-0.592 (0.467)	-0.591 (0.468)	-0.595 (0.468)
Currency union	0.042 (0.102)	0.042 (0.102)	0.042 (0.102)	0.042 (0.102)
Regional free trade area	0.253 (0.179)	0.255 (0.179)	0.256 (0.179)	0.254 (0.179)
R2 within	0.05	0.05	0.05	0.05
R2 between	0.52	0.52	0.52	0.52
R2 overall	0.38	0.38	0.38	0.38

Notes: Number of observations = 554,150.

Table 4: Are there differences in effects on exporters and importers?

Terrorist incident in exporting country	-0.124** (0.007)		-0.065** (0.009)
Terrorist incident in importing country	0.048** (0.007)		0.011 (0.009)
Terrorist incident with injuries in exporting country		-0.153** (0.009)	-0.086** (0.011)
Terrorist incident with injuries in importing country		0.079** (0.009)	0.060** (0.011)
Terrorist incident with fatalities in exporting country			-0.138** (0.009)
Terrorist incident with fatalities in importing country			-0.046** (0.011)
Terrorist incident with fatalities in importing country		0.060** (0.009)	0.015 (0.011)
Log number of terrorist incidents	-0.096** (0.005)		-0.097** (0.006)
Log number of terrorist incidents	0.033** (0.005)		0.031** (0.006)
Log number of injured in terrorist incidents		-0.043** (0.003)	-0.006 (0.005)
Log number of injured in terrorist incidents		0.024** (0.003)	0.008# (0.005)
Log number of fatalities in terrorist incidents			-0.050** (0.004)
Log number of fatalities in terrorist incidents			0.010# (0.006)
Log number of fatalities in terrorist incidents		0.026 (0.004)	-0.008 (0.006)

Notes: Number of observations = 554,150.

Table 5: Is Al Qaeda different?

Terrorist incident	0.019 (0.014)
Terrorist incident with injuries	-0.071** (0.016)
Terrorist incident with fatalities	-0.032# (0.017)
Al Qaeda incident	0.143** (0.043)

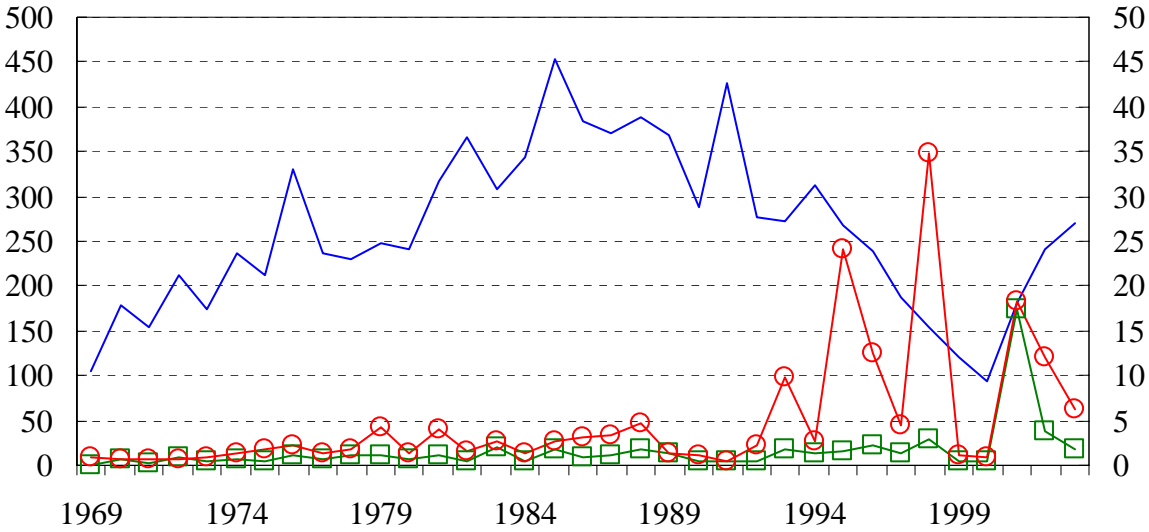
Notes: Number of observations = 193,339. Period 1995-2003

Appendix table 1: Specification sensitivity

	Pooled OLS	Pairwise fixed effects	Pairwise random effects
Terrorist incident	-0.036* (0.015)	-0.046** (0.006)	-0.027** (0.006)
Terrorist incident with injuries	0.073** (0.013)	-0.033** (0.007)	-0.027** (0.007)
Terrorist incident with fatalities	-0.037** (0.014)	0.019** (0.007)	0.010 (0.007)
Log distance	-1.279** (0.019)		
Log exporter population	1.081** (0.007)	0.648** (0.018)	0.880** (0.006)
Log importer population	0.888** (0.008)	0.934** (0.018)	0.719** (0.006)
Log exporter GDP p/c	1.212** (0.009)	0.491** (0.006)	0.603** (0.004)
Log importer GDP p/c	1.078** (0.009)	0.586** (0.006)	0.569** (0.004)
Landlocked	-0.185** (0.025)		-0.605** (0.025)
Island	0.447** (0.030)		0.435** (0.028)
Common border	0.713** (0.104)		0.779** (0.093)
Common language	0.396** (0.039)		0.332** (0.037)
Common colonizer	0.804** (0.054)		0.183** (0.047)
Same nation	-1.791** (0.561)		0.425 (1.568)
Ever colony	2.271** (0.096)		3.248** (0.122)
Current colony	1.030* (0.482)	-0.307* (0.151)	-0.125 (0.151)
Currency union	0.313** (0.118)	0.526** (0.049)	0.441** (0.047)
Regional free trade area	1.229** (0.105)	0.248** (0.038)	0.301** (0.036)
R2 within		0.20	0.20
R2 between		0.49	0.67
R2 overall		0.45	0.59
Adjusted R2	0.64		

Notes: Number of observations = 554,150.

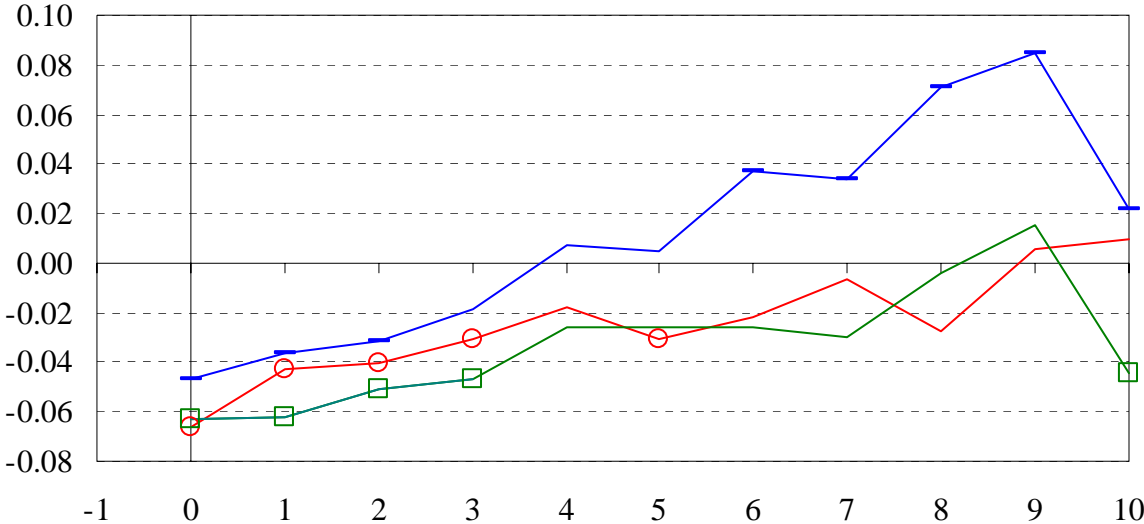
Figure 1: Terrorism and violence



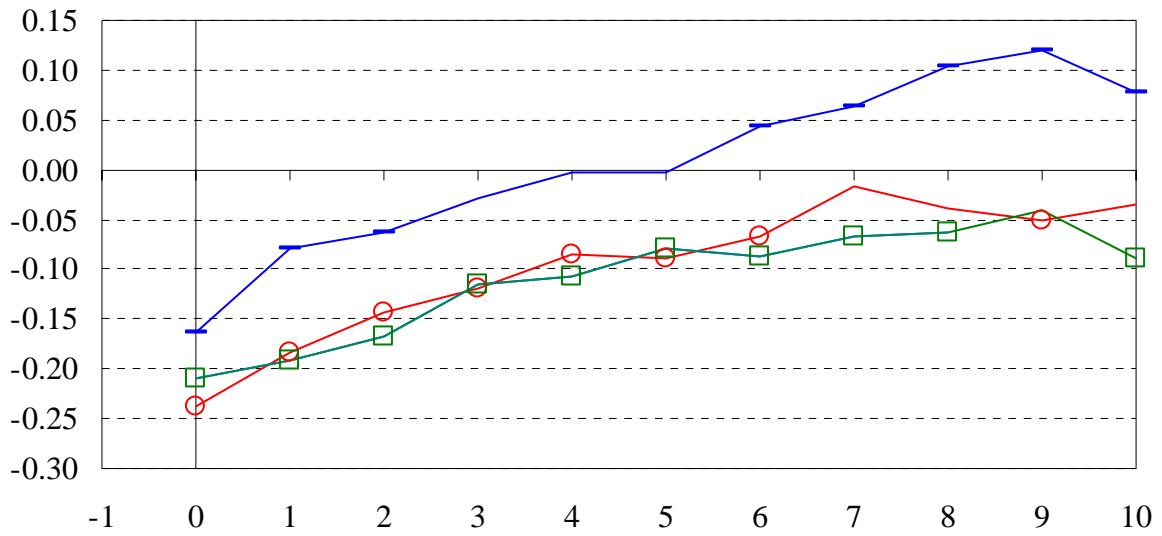
Notes: Line is the number of terrorist incidents (left scale). Line with circles and squares is the number of injuries and fatalities per incident, respectively (right scale). Source is the MIPT Terrorism Knowledge Base.

Figure 2: The time pattern of the impact of terrorism on trade

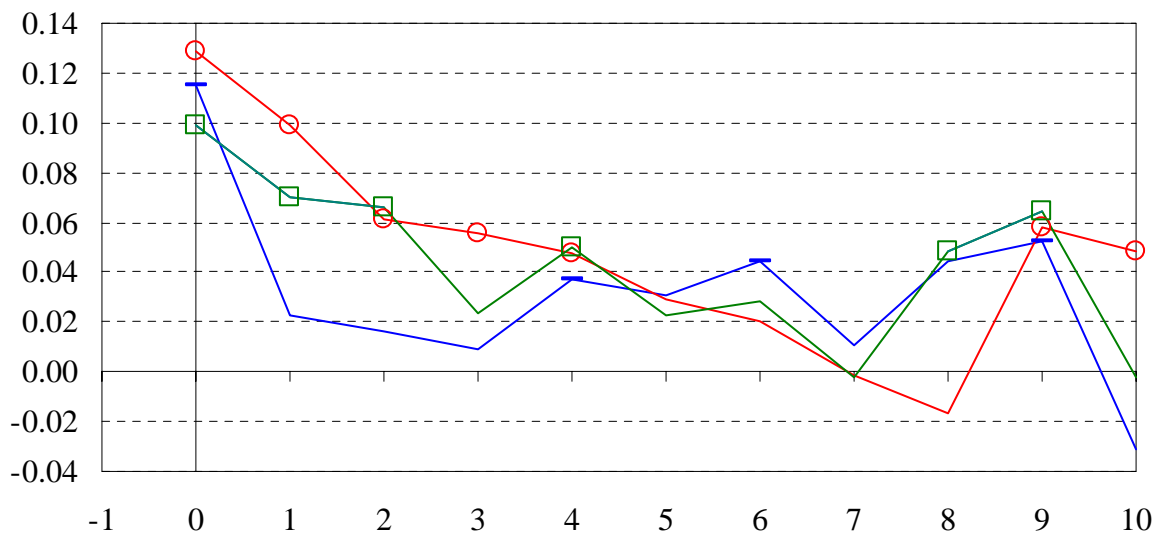
Total



Exporter



Importer



Notes: Coefficients are plotted for terrorist incidents (line), incidents with injuries (line with circles) and incidents with fatalities (line with squares). Coefficients significant at the 5 percent level are marked.