EC3320

2016-2017

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Lecture 18

Today we will discuss the costs of terrorism.

The next slide gives the eight leading causes of death in the US for 2014. (I take the table from this article which uses this database.)

The Eight Leading Causes of Death in the US for 2014 According to the Center for Disease Control (CDC)

Cause of death	Number of U.S. deaths	Rate of deaths
1. Cardiovascular disease	**614,348**	**193 per 100,000**
2. Cancer	**591,699**	**186 per 100,000**
3. Chronic lower respiratory disease	**147,101**	**46 per 100,000**
4. Accidents	**136,053**	**43 per 100,000**
5. Strokes	**133,103**	**42 per 100,000**
6. Alzheimer's disease	**93,541**	**29 per 100,000**
7. Diabetes	**76,488**	**24 per 100,000**
8. Influenza and pneumonia	**55,227**	**17 per 100,000**

The next slide gives some more causes of death taken from the same table (which I could not get to fit comfortably on one slide.)

More Causes of Death in the US for 2014 According to the CDC

Drug overdoses	47,055	15 per 100,000
Kidney disease	48,146	15 per 100,000
Intentional self-harm	42,773	13 per 100,000
Septicemia	38,940	12 per 100,000
Liver disease	38,170	12 per 100,000
Transportation accidents	37,195	12 per 100,000
Parkinson's disease	26,150	8 per 100,000
Firearm assault	10,945	3 per 100,000
HIV	6,721	2 per 100,000
Pedestrian deaths	6,258	2 per 100,000

The Global Terrorism Database (GTD) lists the following numbers of deaths in the US due to terrorism:

2015 - 44

2014 - 19

2013 - 22

2012 - 7

The year with the most deaths by far is 2001, the year when 9/11 happened - but even the 3,004 deaths in 2001 is still well below the number for pedestrian deaths in 2014.

In most years the number of terrorism deaths in the US is comparable in scale to the causes of death spread over the next two slides (taken from the same article I used for the earlier tables).

Minor Causes of Death in the US in 2014 According to the CDC

Cause of Death	**Number of U.S. deaths in 2014 (total deaths = 2.6 million)**
Dengue fever	2
Venomous snakes or lizards	5
Nonvenomous insects	6
Venomous spiders	7
Malaria	8
Nonpowered aircraft (Ex: hot air balloons, hang gliders)	13
Lightning	25
Struck or bitten by dog	36

More Minor Causes of Death in the US in 2014 According to the CDC

Salmonella infection	45
Cataclysmic storm	61
Mauled by a mammal (not including dogs)	83
Avalanche, landslide or other Earth movement	85
Contact with venomous plants or animals (Ex: bees, scorpions)	91
Explosions (including gas)	116

We should, however, bear in mind the following caveat.

These risks are computed by looking at the historical record.

However, suppose that there is a very small, but non-negligible, risk of a really massive attack, such as a terrorist nuclear explosion - then the risk of dying in a terrorist event would be much higher than the figures on slide 4 show.

We now turn to an assessment of the impact of terrorism based on this book by Alan Krueger.

Krueger marshals a number of arguments suggesting that the impact of terrorism is small:

1. Human capital (skills, education, health, etc.) is more important to an economy than is physical capital.

But terrorism does not tend to destroy a lot of human capital since, at least historically, there have not been many people killed or injured through terrorism.

Consistent with this point is the fact that countries like the UK, Germany and Japan recovered very quickly from the physical damage of World War II.

A big part of this post-war success is the fact that there were still a lot of people with good human capital around at the end of the war.

2. Sometimes there are easy substitutes for things that were destroyed by terrorism.

Krueger gives a really nice example of how right after 9/11 (which obviously destroyed a lot of physical capital) financial firms just switched their offices to hotel rooms that were empty because tourism and the convention business in New York had been disrupted by the attack.

I wonder, though, how generally true it is that easy substitutes are available for physical capital destroyed in terrorist attacks – Krueger's 9/11 example may be unusual.

3. Many people are employed in the counterterrorism business so there can actually be an employment benefit from terrorism.

Note, however that this mechanism of terrorism creating jobs only works if an economy is below full employment.

When an economy is enjoying full employment then increased employment in counterterrorism can only come at the expense of decreased employment in other industries - in this case there will be no macroeconomic benefit to growth in counterterrorism spending.

However, below full employment there could be potential employment gains coming from growth in the counterterrorism industry.

Krueger also tries to present a case that terrorism might have a big economic impact, although I think that for the most part the material he provides tends to suggest the opposite.

1. Certain industries, like tourism and conventions, are hit hard by terrorism.

However, industries like tourism and conventions are a very small part of most economies.

So this observation is consistent with the notion that the overall economic effects of terrorism are small.

2. Terrorism itself does not directly inflict big costs on an economy but overreaction to terrorism is, indeed, very costly.

This is an argument I am sympathetic with and anyone who has flown on an airplane should be able to grasp the point straight away.

You should also recall that the Mueller and Stewart paper from lecture 2 tries to quantify this phenomenon.

Krueger emphasizes how the tightening of visa procedures after 9/11 made it difficult for highly educated people to get visas to work in the US in Silicon Valley or at universities - another possible example is the invasion of Iraq itself which, arguably, was an overreaction to a perceived terrorist threat.

4. Krueger mentions the Abadie and Gardeazabal paper on Basque terrorism that we covered in lecture 9.

This is good evidence of a fairly substantial economic impact of terrorism.

However, this effect only applies to the Basque region of Spain, so even within Spain the overall damage is still not all that big.

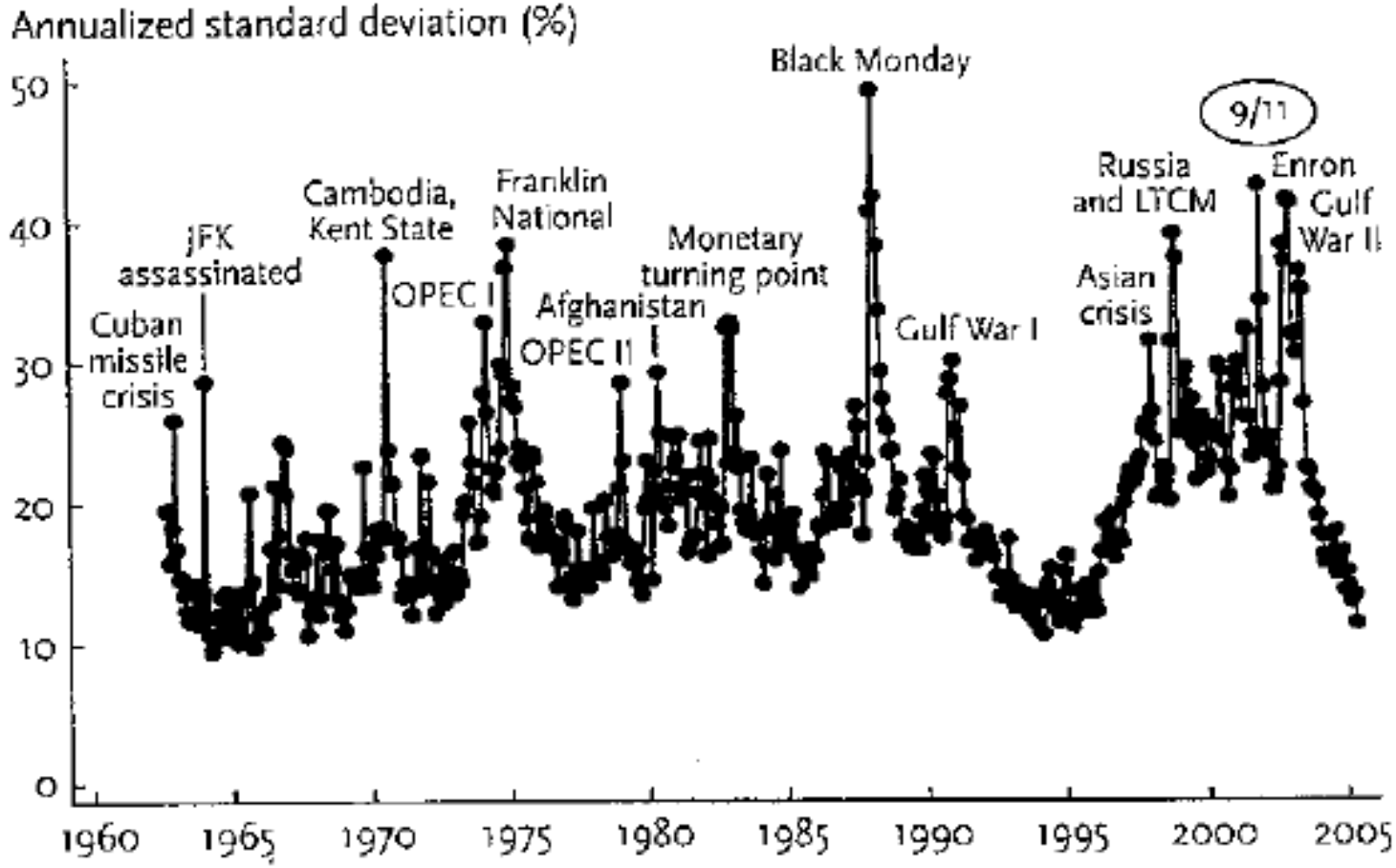
5. Krueger refers to a paper by Bloom (2006) showing that U.S. stock market volatility was very high right after 9/11 (slide 16).

However, there is still another step that needs to be made for this argument to stick - stock market volatility must translate into big economic losses and it is not clear that it does.

It might be that firms invest less during highly volatile periods than they do during more stable periods and this investment shortfall inflicts economic damage.

Beyond that, the post 9/11 volatility does did not persist for very long so, again, it is not really clear that there are big economic losses to be found here.

Figure 3.1 Monthly U.S. stock market volatility, 1962–2004. From Bloom (2006).



6. The table on slide 18 gives an event study of the stock prices of 75 companies that were targeted by terrorists.

We see an average drop of 0.83% on the day of the attacks while returns for the week prior and the week after the attack are never statistically different from 0 - so it seems that there is a fairly large effect that does not dissipate within a week.

It is possible that this 0.83% decrease dissipates over a longer period - but even if we assume that it lasts forever it is still not a gigantic effect.

More importantly, the 0.83% only pertains to companies that are directly targeted by terrorists - such companies will only be a small fraction of all the companies in the larger economy so this table is interesting but it is not really evidence of a large impact of terror on the economy.

Table 3.1 Abnormal Stock Returns around the Day of a Terrorist Attack for Seventy-Five Targeted Companies

Days before or after terrorist attack	Abnormal return (%)	*t*-ratio
–7	–0.07	–0.1
–6	0.00	0.0
–5	0.25	1.2
–4	0.21	1.0
–3	0.21	1.0
–2	–0.39	–1.7
–1	0.33	1.6
0	–0.83	–4.0
1	0.11	0.4
2	0.16	0.9
3	0.06	0.3
4	–1.14	–1.1
5	0.46	1.2
6	–0.28	–1.3
7	–0.30	–1.0

Source: Karolyi and Martell (2005).

7. The table on the next slide shows that some companies lose huge amounts of money from terrorist attacks.

But these are just a few companies so, again, this does not amount to a big macroeconomic effect.

Table 3.2 Largest Losses from Terrorist Attacks

Company	Cumulative loss (billions of US$)
Royal Dutch Shell	10.3
British Petroleum–Amoco	7.3
Coca-Cola	4.3
McDonald's	3.7
American Airlines	2.3

Source: Karolyi and Martell (2005).

Frey, Luechinger and Stutzer (FLS) use an innovative method to assess the costs of terrorism.

But before diving into this paper we will take a quick look at arguments presented in a different paper by the same authors explaining why some other possible approaches to assessing the costs of terrorism will not work very well.

All approaches discussed by FLS are based on the idea that terrorism is a negative “public good”, something that is sometimes known as a “public bad”.

The main idea of viewing terrorism as a public good is that once the threat of terrorism afflicts some members of a society then all members of the society are affected. In other words, I cannot just opt out of the terrorism threat to the UK by declaring myself exempt.

This does not mean that everyone is hurt equally by terrorism – some may suffer more than others – but no one is immune.

FLS seek to estimate to estimate how much each person is hurt by terrorism and add all of these up to get a total.

FLS discuss two alternatives to the approach they ultimately take, both of which they say are seriously flawed. These are:

1. *The contingent valuation method* – you just ask people how much they would pay for quantifiable reductions in terrorist threats.

For example, one study asked how much people would pay to reduce the risk of a terrorist attack on a plane by a) 50%, b) to one in a million, c) to one in ten million or d) to zero.

You could ask the reverse question, for example, how much do I need to pay you to get you to accept a doubling of the risk a terrorist attack on the airplane you are traveling on?

Among the problems with this approach:

a. It is hard for people to imagine these scenarios. People are not clear on exactly what the risk of terrorism is in the first place so they do not know how to evaluate a 50% reduction, let alone how the current risks they face compare to a one in a million risk.

b. People may answer the question strategically. For example, some people may fear that if they say how much they are really prepared to pay for a reduction in terrorism then the price of plane tickets will go up by a lot.

c. Psychological research suggests that people take losses more seriously than gains so they would pay more to avoid increases in terrorism risks than they would need to be paid to accept equivalent increases in risks. This asymmetry makes it hard to value policy proposals.

2. *The hedonic market approach* – you use market prices, usually housing prices and wages, to measure the value people attach to avoiding terrorism risk. The Besley and Mueller paper (lecture 7) on housing prices in Northern Ireland follows this approach as does the Bahney et al. paper from the Autumn week 3 seminar.

Problems with the hedonic market approach include the following:

1. Again, it is hard for people to understand the risks they face and, therefore, it is hard to build these risks into market housing prices or into wages.

2. Many factors determine wages and housing prices and it may be difficult to control for all of them. Besley and Mueller benefitted from having detailed data on housing prices and violence by neighbourhood. Usually we do not have such good data.

FLS use what they call a *Life Satisfaction Approach* (LSA). There are two main pillars to this approach:

1. A question that has been on the *Euro-Barometer Survey Series* going back to 1970:

> "On the whole, are you very satisfied [4], fairly satisfied [3], not very satisfied [2], or not at all satisfied [1] with the life you lead?"

Notice that this is not a question about terrorism.

2. Data on terrorist events. One of their main sources is something called the MIPT database which used to be freely available on the internet but is now gone, largely replaced by the GTD database that I linked to on slide 4 above.

Briefly, the idea of FLS is to keep asking people how happy they are and figure out whether they tend to be less happy when they are living through terrorist events than they are during periods when there are few or no such events.

Beyond that, FLS try to quantify how fast people slide down the happiness scale as terrorism increases.

An advantage of this approach is that survey respondents do not have to focus specifically on how they feel about terrorism – they just have to say how satisfied they are with their lives.

A problem with this approach is there are a very large number of things that contribute to how happy people feel. FLS deal with this by trying to control for as many things as possible using regression analysis.

FLS do separate estimates for France and for the British Isles.

The British Isles includes Great Britain (essentially the big piece of land we are on now), Northern Ireland and Ireland. France is also broken into three regions – Paris, the Provence-alpes-cotes-d'azur region, and the rest of France.

To be honest I cannot find anything in the paper explaining why FLS single out Provence-alpes-cotes-d'azur. Paris has obvious special importance but then so does London so these choices seem a little strange to me.

The next two slides give summary statistics on the terrorism data.

	Rest of France	Paris	Provence-Alpes-Côte d'Azur
Mean	3.46	13.04	3.35
Std. Dev.	3.94	13.80	4.15
Min	0	0	0
Max	18	66	17

Fig. 1 Number of terrorist attacks in France 1973–2002. Source: RAND-St. Andrews Chronology of International Terrorism, provided by MIPT (www.mipt.org)

	Rest of France	Paris	Provence-Alpes-Côte d'Azur
Mean	1.42	3.58	0.70
Std. Dev.	2.32	4.73	2.07
Min	0	0	0
Max	9	18	10

Fig. 2 Number of terrorist fatalities in France 1973–2002. Source: RAND-St. Andrews Chronology of International Terrorism, provided by MIPT (www.mipt.org)

	Ireland	Great Britain	Northern Ireland (right ordinate)
Mean	1.08	13.12	1,035.88
Std. Dev.	1.47	9.97	709.57
Min	0	0	232
Max	5	37	3,336

Fig. 3 Number of terrorist attacks in the British Isles 1975–2002. For Great Britain, the *bars above partition* denote attacks not related to the 'Troubles'. Sources: RAND-St. Andrews Chronology of International Terrorism, provided by MIPT (www.mipt.org), Sutton (1994) and an updated version of the Sutton index provided by CAIN Web Service (www.cain.ulst.ac.uk), and statistics provided by the PSNI (www.psni.police.uk)

	Ireland	Great Britain	Northern Ireland (right ordinate)
Mean	2.16	3.8	80.84
Std. Dev.	2.46	3.95	62.99
Min	0	0	7
Max	9	16	287

Fig. 4 Number of terrorist fatalities in the British Isles 1975–2002. For Great Britain, the *bars above partition* denote attacks not related to the 'Troubles'. Sources: RAND-St. Andrews Chronology of International Terrorism, provided by MIPT (www.mipt.org), Sutton (1994) and an updated version of the Sutton index provided by CAIN Web Service (www.cain.ulst.ac.uk), and statistics provided by the PSNI (www.psni.police.uk)

FLS estimate the following equation:

$$LS_{irt} = \beta_0 + \beta_1 T_{rt} + \beta_2 \ln(m_{irt}) + \beta_3 Z_{irt} + \rho_r + \tau_t + \varepsilon_{irt}.$$

where

LS_{irt}, i.e., the life satisfaction of individual i living in region r at time t, is explained by differences in the level of terrorism, T_{rt}, across regions and over time, the log of individual household income, m_{irt}, other personal characteristics Z_{irt}, as well as region and time fixed effects ρ_r and τ_t, respectively.

The table spread over the next two slides gives the main results of the paper.

Table 1 Basic results: Effect of terrorism on life satisfaction: UK, Ireland and France, 1973–2002

Dependent variable	British Isles				France			
Life satisfaction	(1)		(2)		(3)		(4)	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Terrorism								
Incidents	−7.6E-5***	−3.90			−2.2E-3***	−2.74		
Fatalities			−6.4E-4***	−3.45			−5.0E-3**	−2.50
HH income								
ln(HH income)	0.168***	19.12	0.167***	19.03	0.250***	20.29	0.250***	20.23
HH size$^{1/2}$	−0.095***	−7.84	−0.094***	−7.77	−0.160***	−12.13	−0.160***	−12.09
Personal characteristics								
Male	Reference group		Reference group		Reference group		Reference group	
Female	0.081***	11.82	0.081***	11.80	0.033***	3.85	0.033***	3.87
Age	−0.016***	−12.24	−0.016***	−12.32	−0.022***	−12.33	−0.022***	−12.33
Age^2	2.E-4***	14.41	2.E-4***	14.48	2.E-4***	12.04	2.E-4***	12.05
Single	Reference group		Reference group		Reference group		Reference group	
Married	0.079***	6.29	0.079***	6.31	0.057***	4.10	0.057***	4.09
Living together	0.002	0.09	0.001	0.07	0.022	1.44	0.022	1.44
Separated	−0.277***	−9.45	−0.277***	−9.42	−0.179***	−4.99	−0.179***	−5.00
Divorced	−0.209***	−8.99	−0.209***	−8.98	−0.146***	−6.20	−0.147***	−6.22
Widowed	−0.099***	−5.89	−0.099***	−5.91	−0.105***	−4.76	−0.106***	−4.78
No children in HH	Reference group		Reference group		Reference group		Reference group	
One child	−0.025*	−1.74	−0.025*	−1.73	0.012	0.64	0.012	0.62
Two children	−0.016	−0.96	−0.016	−0.97	0.061**	2.56	0.060**	2.53
Three children	−0.023	−0.87	−0.023	−0.88	0.076**	2.58	0.075**	2.56
Four and more children	−0.025	−0.94	−0.025	−0.96	−0.081	−1.21	−0.082	−1.22

Table 1 (*Continued*)

Dependent variable	British Isles				France			
Life satisfaction	(1)		(2)		(3)		(4)	
	Coef.	t-value	Coef.	t-value	Coef.	t-value	Coef.	t-value
Employed or self-employed	Reference group		Reference group		Reference group		Reference group	
Other occupation	0.130***	6.85	0.130***	6.84	0.239***	9.81	0.239***	9.82
Housekeeping	−0.038***	−3.55	−0.038***	−3.55	0.061***	4.79	0.061***	4.78
Retired	−0.002	−0.16	−0.002	−0.15	0.152***	7.17	0.152***	7.16
Unemployed	−0.411***	−18.83	−0.410***	−18.80	−0.202***	−8.35	−0.202***	−8.35
Living in rural area	Reference group		Reference group		Reference group		Reference group	
Living in small towns	−0.051***	−5.27	−0.051***	−5.26	−0.065***	−5.66	−0.066***	−5.68
Living in a big town	−0.120***	−11.90	−0.120***	−11.91	−0.078***	−6.03	−0.078***	−6.10
Region specific effects	Yes		Yes		Yes		Yes	
Year specific effects	Yes		Yes		Yes		Yes	
Constant	Yes		Yes		Yes		Yes	
Number of observations	62,320		62,320		38,062		38,062	
Number of clusters	75		75		76		76	
Prob > *F*	0.000		0.000		0.000		0.000	
R^2	0.079		0.079		0.074		0.074	

Notes: (1) OLS estimates. (2) Standard errors are adjusted for clustering within regions per year.

*** Significant at the 99% level,

** Significant at the 95% level,

* Significant at the 90% level

Note the negative and significant coefficients at the top of the table.

Here is a quick clarification on notation:

-7.6 E -5 is a way to write $-7.6x10^{-5}$ which is the same as 0.000076

This coefficient seems very small but it is hard for us to evaluate so FLS convert this information into money terms using the concept of *compensating surplus*.

Notice that the regression includes a coefficient on income so we can use this equation to estimate how much income people would give up in order to receive a certain decrease in terrorism while holding their satisfaction score constant.

This table gives some compensating surplus calculations:

Table 4 Compensating surplus for a reduction in terrorism

	British Isles 1975–1998		France 1973–1998	
Average annual household income	$20,501		$26,067	
Reduction of terrorism	1,022.76 acts	77.04 deaths	9.58 acts	2.16 deaths
Basis: least square estimations (Table 1)				
Compensating surplus (*CS*)	$7,641	$5,252	$2,149	$1,099
	($891)	($892)	($683)	($413)
CS in percent of income	37.3%	25.6%	8.2%	4.2%
	(4.3%)	(4.4%)	(2.6%)	(1.6%)

Notes. (1) *CS* is calculated for residents of Paris and of Northern Ireland for a reduction terrorism to the intensity of terrorism in the more peaceful parts of the respective countries. (2) *CS* estimates are in 2004 US dollars. (3) Bootstrapped standard errors in parentheses (1000 replications)

The next worksheet will take you through these compensating surplus calculations. Here we will just discuss the interpretation.

First, the change in terrorism is set at the difference in violence between the most peaceful region and the least peaceful region so the calculations give how much compensation would be required so that people can live in the most dangerous region while being as happy as they would have been in the least dangerous region, all else equal.

In France these are already substantial sums but in the British Isles they are huge, to the point where it is a little hard for me to believe that these numbers can be approximately true.

FLS take a very microeconomic approach, doing all their estimation at the level of the individual.

Llussá and Tavares are at the other extreme, approaching the cost of terrorism from a macroeconomic perspective with country-year being the unit of analysis.

They use the above-mentioned Global Terrorism Database which is what everyone uses these days. It has a very nice, searchable online system.

The next slide gives (half of) their main table (I omit “random effects” estimates which is a technique we have not discussed and that I do not want to get in to.)

Table 1
Type of terrorist attack and aggregate growth. Panel estimates – fixed and random effects.

	Fixed effects			
	Private consumption growth (SE) [*t*-ratio]	Public expenditure growth (SE) [*t*-ratio]	Private investment growth (SE) [*t*-ratio]	Output growth (SE) [*t*-ratio]
Attacks	**−0.0098*****	−0.0022	**−0.0027*****	−0.0041
	(0.0028)	(0.0034)	**(0.0008)**	(0.0026)
	[−3.50]	[−0.66]	**[−3.35]**	[−1.57]
Killed	**−0.0034*****	−0.0005	**−0.0007*****	−0.0013
	(0.0006)	(0.0019)	**(0.0003)**	0.0011
	[−5.95]	[−0.27]	**[−2.72]**	[−1.15]
Injured	**−0.0010*****	**−0.0007***	**−0.0003****	0.0000
	(0.0003)	**(0.0004)**	**(0.0001)**	0.0010
	[−3.75]	**[−1.75]**	**[−2.19]**	[0.00]
By known	**−0.0114*****	−0.0019	**−0.0034*****	**−0.0061*****
	(0.0032)	(0.0052)	**(0.0009)**	**(0.0019)**
	[−3.57]	[−0.37]	**[−3.75]**	**[−3.25]**
On civilians	**−0.0168*****	−0.0050	**−0.0053*****	**−0.0073***
	(0.0054)	(0.0053)	**(0.0014)**	**(0.0043)**
	[−3.09]	[−0.96]	**[−3.73]**	**[−1.71]**
On military	**−0.0280*****	0.0068	**−0.0069*****	−0.0107
	(0.0073)	(0.0147)	**(0.0024)**	(0.0074)
	[−3.81]	[0.46]	**[−2.83]**	[0.15]
On political	**−0.0404*****	−0.0262	**−0.0094****	−0.0127
	(0.0139)	(0.0171)	**(0.0036)**	(0.0170)
	[−2.91]	[−1.54]	**[−2.58]**	[0.46]

Note: Fixed and Random Effects estimates in columns 1 to 4 and 5 to 8, respectively. The dependent variable is Growth of Real Private Consumption, Public Expenditure, Investment, and Output. The coefficient on real per capita GDP, included as a control variable in all specifications, is not reported for reasons of parsimony. Coefficient estimates are noted as significant at the 1% (***), 5% (**), and 10% (*) levels. Standard deviations and *t*-values are in parentheses. Coefficients that are significantly different from 0 at the 1%, 5%, and 10% levels are noted in bold.

For private consumption and private investment the effects are consistently negative and significant. The coefficients for public expenditure and output are mostly not significant.

The figure below shows that the effects of terrorism on the macroeconomic variables considered are economically substantial as well.

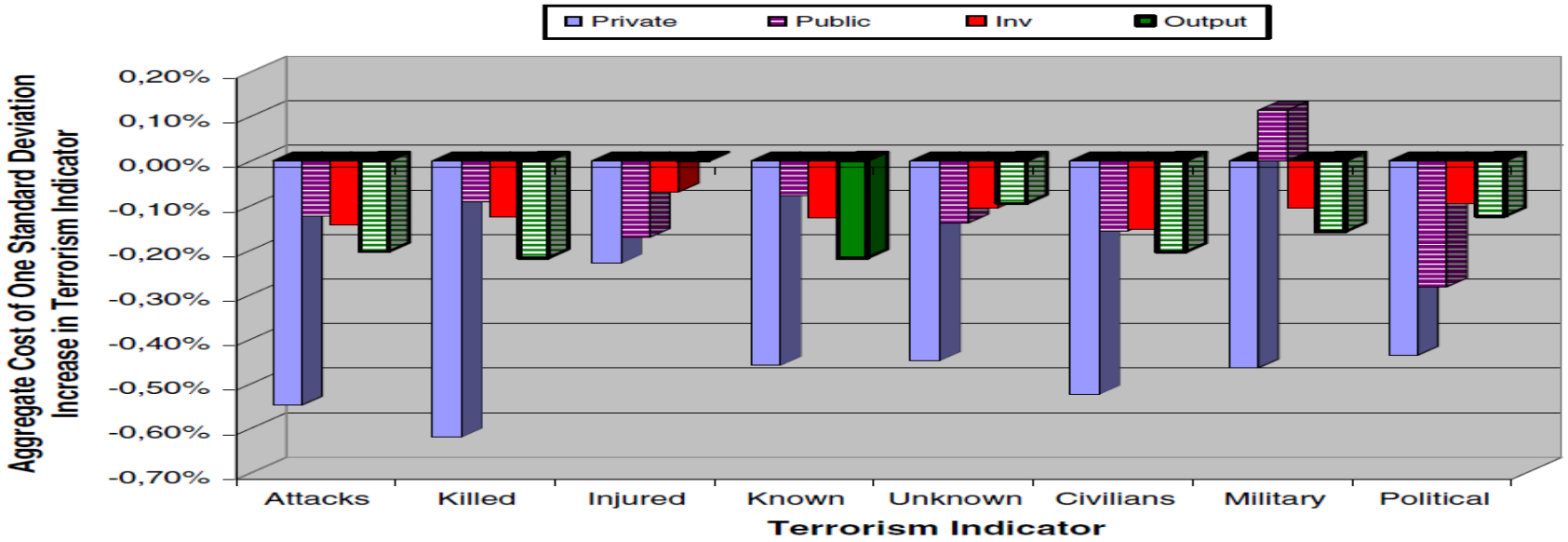


Fig. 1. Types of terrorism and aggregate costs-fixed effects estimates.