Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Which terror at which cost? On the economic consequences of terrorist attacks[☆]

Fernanda Llussá [a], José Tavares [b,c,*]

[a] Faculdade de Ciências e Tecnologia, Universidade Nova de Lisboa, Portugal
[b] Faculdade de Economia, Universidade Nova de Lisboa, Portugal
[c] Centre for Economic Policy Research (CEPR), Portugal

ARTICLE INFO

ABSTRACT

We assess the cost of different types of terrorist attacks on the growth of output and of its components. Private Consumption and Private Investment are significantly and negatively affected by all terror indicators, and the largest impact is respectively associated with the number of victims or the number of attacks.

© 2010 Elsevier B.V. All rights reserved.

1. On the economic costs of terror

As a response to the heightened importance of terrorism since the September 2001 attacks, research on the economics of terrorism has burgeoned in recent years, providing new answers and raising new questions addressing the consequences of terror attacks.[1] Much of the existing literature examines the economic consequences of terrorist attacks at the aggregate and sectoral levels.[2] Some of these studies examine the costs of terrorism in terms of the different economic aggregates – e.g., consumption and investment, but there is no systematic empirical analysis of the impacts of terrorism on the different aggregates.[3]

In spite of the availability of data on the nature of terrorist organizations, the type of target, and the casualties inflicted, those data have not been used to investigate the differential effect of the attacks. Our paper proposes to provide a first estimate of the economic cost of different types of terror attacks on different economic aggregates. We do so by using a newly collected cross-country dataset and a parsimonious specification that highlights how different economic costs relate to different types of terror.

Terrorism ranges from ethnically motivated to state-sponsored, from religious to ideologically motivated; it can directly target the government, the military or the civilian population, assassinate individuals or threaten the use of weapons of mass destruction.[4] The economics literature has shown that terrorism attacks are highly volatile and rare events regarding their frequency over time and across countries; rich countries are the most often targeted – in particular Israel and the United States. In addition, the cost of terrorism may increase if the attacks persist over time or are regionally concentrated.[5] Though less frequently targeted, poor

---

[1] At the outset, one should clearly state that the cost of terrorism goes beyond the economic damages. This is a conceptual issue but also finds support in the view put forward in Becker and Rubinstein (2004) and Frey et al. (2004) that the utility costs may surpass a rational evaluation of probabilities and outcomes, so that the perceived costs can be quite substantial.

[2] A parallel avenue for research is put forward, for example, by Gassebner et al. (2008), who assess the electoral consequences of terrorism, to find that a terrorist attack increases the probability that the incumbent cabinet falls and the magnitude of the effect is greater for more severe attacks.

[3] See the recent surveys by Llussá and Tavares (2007, 2008) and Bruck and Wickström (2004).

[4] See Enders and Sandler (1995, 2002) and Frey (2004) for a discussion. In this paper, we adopt Enders and Sandler´s (2002) view of terrorism as "the premeditated use or threat of use of extra-normal violence or brutality by sub-national groups to obtain a political, religious, or ideological objective through intimidation of a huge audience, usually not directly involved with the policymaking that the terrorists seek to influence", the most frequently used in studies of terrorism.

[5] As documented, respectively, in Eckstein and Tsiddon (2004) and Abadie and Gardeazabal (2003).

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

	Fixed effects				Random effects			
	Private consumption growth (SE) [t-ratio]	Public expenditure growth (SE) [t-ratio]	Private investment growth (SE) [t-ratio]	Output growth (SE) [t-ratio]	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	**−0.0071*****	−0.0014	**−0.0029*****	−0.0024
	(0.0028)	(0.0034)	**(0.0008)**	(0.0026)	**(0.0018)**	(0.0024)	**(0.0008)**	(0.0019)
	[−3.50]	[−0.66]	**[−3.35]**	[−1.57]	**−3.90**	[−0.57]	**[−3.58]**	[−1.23]
Killed	**−0.0034*****	−0.0005	**−0.0007*****	−0.0013	**−0.0028*****	−0.0001	**−0.0008*****	−0.0009
	(0.0006)	(0.0019)	**(0.0003)**	0.0011	**(0.0006)**	(0.0014)	**(0.0003)**	(0.0010)
	[−5.95]	[−0.27]	**[−2.72]**	[−1.15]	**[−4.89]**	[−0.10]	**[−3.15]**	[−0.84]
Injured	**−0.0010*****	**−0.0007***	**−0.0003****	0.0000	**−0.0008*****	−0.0003	**−0.0004*****	0.0002
	(0.0003)	**(0.0004)**	**(0.0001)**	0.0010	**(0.0002)**	(0.0004)	**(0.0001)**	(0.0011)
	[−3.75]	**[−1.75]**	**[−2.19]**	[0.00]	**[−4.06]**	[−0.74]	**[−3.72]**	[0.16]
By known	**−0.0114*****	−0.0019	**−0.0034*****	**−0.0061*****	**−0.0089*****	−0.0013	**−0.0034*****	**−0.0039***
	(0.0032)	(0.0052)	**(0.0009)**	**(0.0019)**	**(0.0026)**	(0.0036)	**(0.0013)**	**(0.0020)**
	[−3.57]	[−0.37]	**[−3.75]**	**[−3.25]**	**[−3.39]**	[−0.36]	**[−2.68]**	**[−1.93]**
On civilians	**−0.0168*****	−0.0050	**−0.0053*****	**−0.0073***	**−0.0127*****	−0.0031	**−0.0053*****	−0.0043
	(0.0054)	(0.0053)	**(0.0014)**	**(0.0043)**	**(0.0037)**	(0.0041)	**(0.0014)**	(0.0031)
	[−3.09]	[−0.96]	**[−3.73]**	**[−1.71]**	**[−3.45]**	[−0.74]	**[−3.81]**	[−1.41]
On military	**−0.0280*****	0.0068	**−0.0069*****	−0.0107	**−0.0205*****	0.0048	**−0.0072*****	−0.0069
	(0.0073)	(0.0147)	**(0.0024)**	(0.0074)	**(0.0053)**	(0.0088)	**(0.0025)**	(0.0066)
	[−3.81]	[0.46]	**[−2.83]**	[0.15]	**[−3.84]**	[0.54]	**[−2.92]**	[−1.04]
On political	**−0.0404*****	−0.0262	**−0.0094****	−0.0127	**−0.0316*****	−0.0192	**−0.0132*****	−0.0077
	(0.0139)	(0.0171)	**(0.0036)**	(0.0170)	**(0.0093)**	(0.0128)	**(0.0048)**	(0.0130)
	[−2.91]	[−1.54]	**[−2.58]**	[0.46]	**[−3.38]**	[−1.50]	**[−2.76]**	[−0.59]

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.

countries are hurt more by attacks – see Blomberg et al. (2004), while larger and more diversified economies, as well as democracies, seem to suffer less – Sandler and Enders (2007) and Tavares (2004), respectively. Most studies agree that the direct output cost of terrorism is low and short-term.[6] But the current assessment uses results about the impact on output and economic growth. The present study provides a first assessment of whether and how the economic cost of terrorism varies with the type of terror and across economic aggregates.

2. Empirics

It is natural that a severe shock, temporally circumscribed, will affect consumption differently, through a consumption smoothing mechanism, and investment, which may decrease in response to a temporary willingness to free resources for other uses, such as consumption and public spending.[7] Terrorism can affect public spending either as any other unexpected shock would, or through the endogenous response of economic policy-makers.[8] Finally, aggregate output may decrease after a terrorist attack as the combined effect of the three aggregates above – private consumption, investment and government spending, but also because capital flows and trade across borders decrease.[9]

We use annual data on terrorist attacks as collected from the Global Terrorism Database (2010), a newly available and extensive dataset on terrorist attacks. We then manually code and discriminate between number of attacks, type of casualties, type of organization,

and type of target. Observations are available by target country and by year, and all are deflated by country population. The dataset comprises 1427 registered terrorist incidents, covering between 168 and 187 countries,[10] and the years between 1970 and 2007. Most terror attacks in our sample are directed at civilian targets – attacks on military and political targets account for less than half the total, and most attacks are undertaken by known organizations. All indicators of terror incidence display a large relative standard deviation.

The dependent variables studied are the rates of growth of output, private consumption, investment, and public consumption, all in real terms, and in constant dollars. We use the initial value of real output per capita as a control variable in all specifications, but do not report its coefficient for reasons of parsimony.[11] Each specification is estimated using both fixed and random effects, and all specifications use heteroskedastic-consistent robust standard errors. Table 1 and Fig. 1 present our results. Table 1 presents the coefficients associated with different types of terrorist attacks, using fixed and random effects. The first important result is that both Private Consumption and Investment are significantly and negatively affected by all indicators of terrorist attacks. This suggests that, unlike the practice in the earlier literature on the economics of terrorism, output might not be the relevant variable to assess the economic disruption caused by terror attacks. Both Output growth and Public Consumption growth are little affected by terrorism indicators, the exception being Injured for Public Consumption, and attacks by Known organization and on Civilians, for output growth. All of the significant coefficients in Table 1 are negative,[12] suggesting that terrorism indeed imposes an economic cost. In addition, as can be seen, the results change very little when random rather than fixed effects are used as an estimation procedure. Notice that we do not take into account the impact of

---

[6] As documented, for instance, in International Monetary Fund (2001).
[7] These are the mechanisms proposed in Eckstein and Tsiddon (2004) for a differential effect of terrorism on consumption and investment, and the literature has documented such decreases in consumption and investment – Eckstein and Tsiddon (2004) and Blomberg et al. (2004).
[8] The increase in public spending in response to additional security needs is likely to be small - as argued in Gupta et al. (2004), possibly with little impact on deficits – Eichenbaum and Fisher (2005).
[9] As documented in Abadie and Gardeazabal (2008) and Enders and Sandler (1996) for capital flows, and in Nitsch and Schumacher (2004) for trade.

[10] The number of countries included is the maximum possible, as determined by data availability. Typically, there are 168 countries for which data are available for private consumption and public expenditure, 178 for investment, and 187 for output.
[11] This is a simple control for the possibility that the growth rates of output and of its components depend on the income at the beginning of the study period.
[12] As well as the overwhelming majority of the insignificant coefficients.
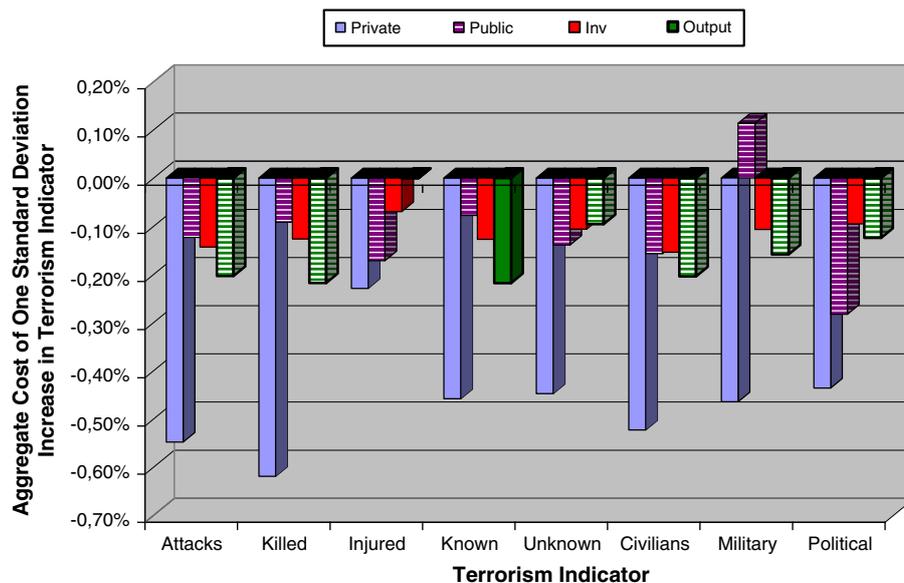
Fig. 1. Types of terrorism and aggregate costs-fixed effects estimates.

terrorism on other country´s aggregate indicators, so that the estimated coefficients are likely to be a lower bound estimate of the impact of terrorism.[13]

Fig. 1 graphically depicts the product of the coefficients in Table 1 – for fixed effects – by the standard deviation of the independent variables measuring the incidence of terrorism. The size of the bars in Fig. 1 indicates the quantitative importance of each terrorism indicator as an explanation for the variability of the dependent variable. Fig. 1 confirms that attacks impose a quantitatively important and significant cost on private consumption and output growth. For Private Consumption, the quantitative impact of the number of those killed is greater than the number of attacks, and the latter is larger than the number of injured. In the case of Investment the number of attacks becomes more harmful than the number of either type of victims. For both Private Consumption and Investment, attacks on civilians are generally more harmful than attacks on the military or on politicians. There are no significant differences as to the impact of attacks by known and by unknown organizations. The average quantitative impact of terrorism on these two indicators is quite substantial, with the typical attack decreasing the growth rate by up to half a percentage point in yearly terms.

3. Concluding remarks

This paper starts from a suggestion that the economic cost of terror attacks varies noticeably with the terror indicator and the aggregate economic indicator under investigation. We find that, indeed, the impact of terror indicators varies widely and Private Consumption and Investment are significantly affected by terror attacks, while Output and Public Consumption are mostly not affected. The number of victims (killed or injured), and the number of attacks, are the most important determinants of falls in Consumption and Investment, respectively, and attacks on civilians those with the largest economic impact. The findings here hint that the benefits of estimating the consequences of terrorism in finer detail – both as relates to the terror

indicator and the economic aggregate affected – will allow us to draw new and important conclusions on the mechanisms through which terror attacks affect the economy.

Appendix

Terrorism Incidence – Source: Global Terrorism Database (2010). Definition: Attacks or casualties per 10 million inhabitants. We compute total attacks, the number of individuals killed and injured in the attacks, attacks by known and unknown organizations, and attacks perpetrated on civilian, military, and political targets. Unit: All terrorism variables computed *per* 10 million inhabitants.

GDP per capita – Source: World Bank (2009). Definition: Real per capita GDP in constant 1995 United States Dollars. Unit: Thousands of dollars.

Output, Public Consumption, Private Consumption, and Private Investment – Source: World Bank (2009). Definition: Growth in real terms. Unit: Percent.

References

Abadie, A., Gardeazabal, J., 2003. The economic costs of conflict: a case study of the Basque country. American Economic Review 93, 113–132.
Abadie, A., Gardeazabal, J., 2008. Terrorism and the world economy. European Economic Review 52 (1), 1–27.
Becker, G.S., Rubinstein, Y., 2004. Fear and Response to Terrorism: An Economic Analysis. Mimeo, University of Chicago.
Blomberg, S., Hess, D., Orphanides, A., 2004. The macroeconomic consequences of terrorism. Journal of Monetary Economics 51, 1007–1032.
Bruck, T., Wickström, B.-A., 2004. The economic consequences of terror: a brief survey. European Journal of Political Economy 20, 293–300.
Eckstein, Z., Tsiddon, D., 2004. Macroeconomic consequences of terror: theory and the case of Israel. Journal of Monetary Economics 51, 971–1002.
Eichenbaum, M., Fisher, J.D., 2005. Fiscal policy in the aftermath of 9/11. Journal of Money, Credit, and Banking 37 (1), 1–22.

---

[13] For example, if output in the United Kingdom is affected by terrorist attacks in France, this effect could be captured by the unobserved effects and wiped out when using fixed effects estimates, or included in the variance components when using random effects. We are thankful to a referee for this point.

Enders, W., Sandler, T., 1995. Terrorism: theory and applications. In: Hartley, K., Sandler, T. (Eds.), Handbook of Defense Economics. Elsevier, Amsterdam, New York and Oxford, pp. 213–249.

Enders, W., Sandler, T., 1996. Terrorism and foreign direct investment in Spain and Greece. Kyklos 49, 331–352.

Enders, W., Sandler, T., 2002. Patterns of transnational terrorism, 1970–1999: alternative time-series estimates. International Studies Quarterly 46, 145–165.

Frey, Bruno S., 2004. Dealing with terrorism: stick or carrot? Edward Elgar Publishers.

Frey, Bruno S., Luechinger, S., Stutzer, A., 2004. Calculating tragedy: assessing the costs of terrorism. Journal of Economic Surveys 21 (1), 1–24.

Gassebner, Martin, Jong-A-Pin, Richard, Mierau, Jochen O., 2008. Terrorism and electoral accountability: one strike, you're out! Economics Letters 100, 126–129.

Global Terrorism Database, 2010. Global Terrorism Database, University of Maryland-Available at: http://www.start.umd.edu/gtd/ 2010.

Gupta, S., Clements, B., Bhattacharya, R., Chakravarti, S., 2004. Fiscal consequences of armed conflict and terrorism in low and middle income countries. European Journal of Political Economy 20, 403–421.

International Monetary Fund, 2001. How has September 11 influenced the global economy. World Economic Outlook 2001, International Monetary Fund, Chapter 2 Washington D.C.

Llussá, Fernanda, Tavares, José, 2007. Economics of terrorism: a synopsis. Economics of Peace and Security Journal 2 (1), 62–70.

Llussá, Fernanda, Tavares, José, 2008. Economics of terrorism: what we know, what we should know and the data we need. In: Keefer, Philip, Loayza, Norman (Eds.), Terrorism, Economic Development and Political Openness. Cambridge University Press. Chapter 8.

Nitsch, V., Schumacher, D., 2004. Terrorism and international trade: an empirical investigation. European Journal of Political Economy 20, 423–433.

Sandler, Todd, Enders, W., 2007. Economic consequences of terrorism in developed and developing countries: an overview. In: Keefer, P., Loayza, N. (Eds.), Terrorism and Development. Cambridge University Press, World Bank.

Tavares, José, 2004. The open society assesses its enemies: shocks, disasters and terrorist attacks. Journal of Monetary Economics 51, 1039–1070.

World Bank, 2009. World development indicators. World Bank, Washington, D.C.