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The open society assesses its enemies: shocks, disasters and terrorist attacks[☆]

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Abstract

This paper conducts a systematic investigation of the incidence and economic costs of terrorist attacks at the country level. We use newly assembled datasets on terrorist attacks, natural disasters and currency crises to answer three different questions: what are the determinants of terrorism; is there an output cost following a terrorist attack; and is that cost larger or smaller in the case of democracies. We find that rich countries are the most prone to suffer attacks while democracies are, if anything, less vulnerable than other countries. The cost to output of a terrorist attack is quantitatively small and closely associated with the occurrence of an event rather than the number of casualties. Finally, we find robust evidence that a terrorist attack imposes a lower output cost the more democratic a country is.

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1. Introduction

The nature and scale of the terrorist attack of September 2001 in New York has raised important new issues for economic policy analysis.¹ The first is the relationship between uncertain catastrophic events and output growth. The September attacks caused massive casualties and substantial physical damage, translating into a sharp negative shock to aggregate US output. Though the economic cost seems to have been of a mostly short-term nature, existing case-studies find that the long-term cost of a continued terrorist threat may range from 4 to 10 percent of Gross Domestic Product.² More importantly, the September 2001 attacks may have opened an era of greater economic uncertainty. A first issue is thus to estimate whether terrorist attacks affect the output of an economy and if so, by how much. At least three reasons add skepticism to the results of existing studies: the diffuse nature of the terrorist threat, the associated difficulty of measurement and the failure to consider terrorism and other catastrophic events simultaneously. Our main purpose in this paper is to estimate the output cost of a terrorist attack and compare it to the cost of other catastrophic events.

Almost immediately after the September 2001 terrorist attacks in the United States, a second important issue came to the fore: what is the connection between political and civic institutions and the exposure to terrorism? More specifically, are democratic countries an easier target for terrorist groups and, if so, how do these countries (and economies) respond to the attacks? The implications are wide-ranging. If democracies are the likelier victims of attack, a possible response can be to adjust political and legal institutions to the increased risk of terrorism. This sentiment has driven recent policy changes in the United States towards some restriction of individual rights. The economics literature has established that political rights are not significantly associated with economic growth—as in Barro (1996) and Tavares and Wacziarg (2001). However, developed political and legal institutions may result in less aggregate risk to the economy. Rodrik (1997, 1998) and, more recently, Acemoglu et al. (2003), put forward the possibility that weak institutions cause macroeconomic volatility through a variety of channels. Furthermore, Easterly (2001) found that well developed institutions diminish the negative economic impact of risk factors such as ethnic diversity. We conjecture that the economic cost of a terrorist attack is, all else equal, less severe in countries with developed institutions, even if these countries were more vulnerable to the occurrence of an attack. Thus, open societies may have different exposure to terrorist attacks either because of increased likelihood of an attack—the *incidence* issue—as well as the economic cost of the attack—the *cost* issue. In other words, democracy may act a risk-reducer, if not as far as incidence, at least in terms of economic cost.

¹The attacks, according to Lenain et al. (2002) mark the largest “insurance-event” in history, by most estimates two to three times as large as the \$21 billion associated with Hurricane Andrew (Florida, 1992).

²The first figure is for the Israeli economy as in World Bank (2002) and the second for the Basque Country, Spain as in Abadie and Gardeazabal (2001).

This paper attempts to provide a first answer to the three questions above. First, we estimate the determinants of the incidence of terrorist attacks, especially as they relate to the level of political rights of the victim country. Second, we estimate the impact of a terrorist attack on GDP growth by comparing, for the first time, the relative impacts of economic shocks, natural disasters and terrorist incidents. Easterly et al. (1993) have suggested that terms of trade shocks are an important determinant of economic growth, while Auffret (2003) uncovers a substantial effect of natural disasters on consumption. Furthermore, in contrast with previous work that focuses on international terrorism, we will assess the impact of an attack irrespectively of its domestic or international terrorist nature. For this we will use a new and broader dataset, in the time and space dimensions. Thirdly, in response to the issues that have arisen following the September 2001 attacks, we assess whether the nature of the political and legal institutions affects the output cost to the economy after a terrorist attack has occurred.

To answer these three questions we rely on existing macroeconomic and institutional data for a wide panel of countries, adding newly compiled datasets on terrorist attacks and natural disasters, as described below. Our expectation is that terrorist attacks have a measurable effect on GDP growth and that the comparison with other aggregate shocks will allow us to gauge the cost of terrorism relative to that of other risky negative events.

The paper is organized as follows: Section 2 reviews the literature on the incidence and the cost of terrorism and mentions the importance of other shocks; Section 3 presents the empirical results.

2. Shocks, disasters and terrorist attacks

In this section, we conduct a brief review of the literature on three background issues of interest to this paper: the causes, incidence and cost of terrorist attacks; the cost of shocks caused by natural disasters and the relationship between the institutional framework of a country and the effects of risk on the economy.

2.1. *The causes, incidence and costs of terrorism*

It is important to start by defining terrorism. One possible such definition sees terrorism as the premeditated use, or threat of use, of extreme violence to obtain a political objective through intimidation or fear directed at a large audience.³ The term “international terrorism” applies to terrorist acts involving citizens or the territory of more than one country, either as victims or perpetrators.

³We have adopted the definition in Krueger and Maleckova (2002). Since 1983, the US State Department has used, for analytical purposes, the definition that “terrorism” involves premeditated and politically motivated violence perpetrated against noncombatant targets by subnational groups or clandestine agents, usually intended to influence an audience.

The objectives of terrorists are very diverse but can be aggregated as three main tactical goals:⁴

1. *Publicity*. Terrorism is one possible means to make a specific objective or cause known to the public. As terrorists seek media attention, cities and urban areas where the damage may be more severe become especially vulnerable.
2. *Destabilize the polity*. Terrorists act outside the constitutional political framework to erode its legitimacy as a way of furthering their chances of achieving their goals.
3. *Damage the economy*. Terrorists seek to impose material cost on the population as a form of pressure on the society as a whole.

This paper focuses on the last two goals of terrorism, that is, the cost to the economy and the relation between the political system and the vulnerability to terrorist attacks. We are particularly interested in the interaction between the two issues.

The “rational criminal” theory developed in [Becker \(1968\)](#) proposes that individuals allocate their time between legal activities and criminal activities in a “rational” way, that is, a way that maximizes their utility. In this calculation, individuals account for the risk of being caught, the probability and size of the penalty, as well as the stigma or moral cost associated with criminal activities. The result is that those who receive a higher marginal benefit from criminal activities are more likely to be involved in those activities. In fact, evidence has shown that lower wage and less educated individuals are more likely to commit property crimes, in contrast with murders and other violent crimes, which are unrelated to personal economic opportunity. In their recent study, [Krueger and Maleckova \(2002\)](#) use micro-data to examine the root causes of terrorism. These authors draw on public opinion surveys in the West Bank and Gaza that measure support for terrorist attacks on Israeli targets. Surprisingly, the authors uncover that the support for violent attacks is not associated with lower educational and economic status. Another dataset, on the characteristics of the terrorist themselves, also shows that higher income and higher education does not lead to lower support for terrorism, independently of which side is involved.⁵

However, most of the studies of the causes and incidence of terrorism have been conducted at the macro-level. An example is [Blomberg et al. \(2002\)](#), who develop a model connecting economic conditions to terrorism. Terrorist activity is seen as the expression of demands for change from groups that are dissatisfied with the political status-quo and who have abandoned constitutional means. The model delivers multiple equilibria, with two possible outcomes: reduced economic activity and

⁴From [Schelling \(1991\)](#), quoted in [Frey and Luechinger \(2002\)](#).

⁵Taylor (1988) had first surveyed the literature to conclude that “Neither social background, educational opportunity or attainment seem to be particularly associated with terrorism.”

frequent terrorist activities or the opposite.⁶ A shortcoming of this model of the emergence of terrorism is its inapplicability to international terrorism.

What do we know about the incidence of terrorism at the aggregate level? [Sandler and Enders \(2002\)](#) have documented several empirical facts. First, transnational terrorism tends to result in relatively few deaths, especially as compared with more frequent events such as accidents on roads and highways. The events of September 2001 stand out as clear outliers in the history of terrorism, despite the fact that, as reported in [Enders and Sandler \(2002a\)](#), terrorist attacks have become more threatening and lethal in recent years. Second, there seems to be a cyclical pattern in the incidence of terrorism, with a large fraction of casualties associated with a small number of events. Finally, attacks aimed at the United States or US interests constitute a substantial portion of total attacks.

[Blomberg et al. \(2002\)](#) document a positive relationship between income per capita and the incidence of terrorist attacks, with Europe and North America the most vulnerable and Africa the least. The United States stands out as the country with the highest absolute number of attacks per year. [Harrigan and Martin \(2002\)](#) have studied the vulnerability of cities to terrorist attacks and conclude that “the same forces that are thought to lead to the formation of cities—namely, the gains derived from the proximity of firms to markets, suppliers, and a large labor pool—will help to preserve cities in the face of an attack.” In the case of a continued threat the costs are certainly higher but, even in this case, the gains from producing and consuming in large agglomerations such as New York largely overwhelm the “tax-like” cost of higher vulnerability to terrorist attacks.

A large number of terrorist attacks originate in unidentified groups, as documented in [Blomberg et al. \(2002\)](#), highlighting the diffuse nature of terrorism. In addition, as reported in [Sandler and Enders \(2002\)](#), there has been a change in the characteristics of terrorist groups in the recent past, with a greater number affiliated with religious rather than leftist organizations. Attacks by religiously motivated individuals tend to be less “focused” as to victims, implying additional uncertainty.

What then are the costs of terrorism and how have they been evaluated in the literature? So far, economic accounts suggest that, in spite of the sharp short-term impact of the attack, the negative effect on production and productivity in the long run might be small. [Lenain et al. \(2002\)](#) identify three possible channels through which terrorism may influence macroeconomic activity: decreased insurance coverage as a result of the perception of increased risk, larger trade costs possibly leading to lower levels of international transactions and larger security and defence

⁶The authors show that in rich and democratic countries economic contractions are associated with increased probability of terrorist activities. A panel data-set of 127 countries between 1968 and 1991 shows that during bad economic times—low growth of output and investment—economies with well-established institutions are more vulnerable to terrorism. In contrast, economies with weak institutions are more vulnerable to civil wars and coups. In a wider study of the relationship between economic cycles and conflict, [Hess and Orphanides \(2001\)](#) have shown that the probability of the United States entering an external conflict doubles when the economy is emerging from an economic contraction and the president is running for reelection.

spending.⁷ Glaeser and Shapiro (2001), focusing on the impact of war and terrorism on cities, agree that the costs are limited.

A different approach has been to undertake case-studies of economies that have been subject to terrorism for extended periods of time. Abadie and Gardeazabal (2001) evaluate the impact of terrorism in the Basque Country in Spain by using the characteristics of this region to create a synthetic Spanish region whose evolution in time can act as a counterfactual—displaying the hypothetical economic behavior of the Basque country in the absence of terrorism. The comparison of the economic dynamics of the synthetic region with the actual data suggests that the GDP of the Basque Country is 10 percent lower as a result of terrorism. Periods of particularly intense terrorist activity are associated with sharper decreases in GDP. World Bank (2002) also uncovers a large cost to the Palestinian–Israeli conflict. This World Bank study estimates at 4 percent of GDP the cost for the Israeli economy, while World Bank (2003b) estimates that the Palestinian territories suffered a 50 percent decline in income per capita between 1994 and 2002. In addition to the aggregate costs, some specific sectors, such as tourist and trade activities, may be especially hurt.⁸

How can societies respond to terrorism so as to decrease its incidence and cost? Here the evidence has not brought good news. Terrorism differs from other major shocks to societies and to the economy since it is the result of the action of “rational” actors.⁹ Accordingly, when governments raise the costs and make terrorism more difficult to pursue, terrorists will quickly switch to other, less costly forms of terror. Enders and Sandler (2002b) report that the installation of metal detectors in airports from 1973 on has indeed decreased skyjackings and associated threats, but at the cost of increasing other kinds of hostage incidents. The measured substitution of skyjacking for other logistically complex events was of nearly one for one. These authors also find strong evidence in favor of intertemporal substitution in terror incidents. Finally, Enders et al. (1990) assess the effectiveness of policies aimed at thwarting terrorist activities and find little evidence for an effect of legislative activity in preventing terrorism.

2.2. *Other shocks and disasters*

According to the Centre for Research on the Epidemiology of Disasters (2003) the number of natural disasters has increased in the past century, their cost increasing

⁷Hobijn (2002) evaluates the third channel by estimating the increase in the cost—to the US government and to the private sector—of extra security measures in response to the September 2001 attack. The estimate is that security costs are in the order of 0.66 percent of GDP in 2003 and will decrease productivity levels in the private sector by only 1.12 percent. However, as the author acknowledges, this is a cost-side study concentrating on the economic effects of the increased expenditure, not a comprehensive evaluation of the economic cost of the terrorist threat.

⁸Enders et al. (1992) use an ARIMA model to find that there are large and substantial losses to the tourism industry caused by terrorist incidents.

⁹This is corroborated in the study by Atkinson et al. (1987). These authors examine the impact of changes in bargaining costs, bluffing and other features of the negotiating environment on the length and severity of the attacks and find that increases in bargaining costs lengthen the duration of a terrorist incident.

dramatically in the last few decades. The rise in cost has occurred in spite of the decreasing number of victims associated with disasters. Benson (2003) reports figures from the United Nations estimating the total cost of disasters during the 1980s at \$120 billion in constant 1990 US dollars, total costs having risen from \$70 and \$40 billion in the 1970s and 1960s, respectively.¹⁰ Furthermore, the comparison between developed and developing economies shows that the absolute cost increases with income while the relative cost—measured as a proportion of national or local wealth—, as well as the number of lives lost, decreases with income.¹¹

Auffret (2003) shows that natural disasters are an important determinant of macroeconomic volatility in the Caribbean region. Despite high consumption growth, this region suffers from a higher, and geographically determined, vulnerability to disasters, which causes high consumption volatility and decreases household welfare.¹² The author presents empirical evidence that consumption volatility is significantly higher in the Caribbean than in the rest of the world.¹³ In this region production shocks tend to translate almost automatically into consumption shocks due to the underdeveloped or ineffective risk-management mechanisms.¹⁴

2.3. *The open society*

The empirical literature on economic growth has shown that political rights and economic growth are not significantly associated. Barro (1996) and Tavares and Wacziarg (2001) both find a negative but insignificant correlation between democracy and growth. However, several authors have suggested that developed political and legal institutions may result in lower aggregate risk in the economy or in lower vulnerability of the economy to shocks. Rodrik (1997) has given three possible reasons for democracies to produce less randomness and to manage shocks better: the range of feasible policies is more restricted than in autocracies, which are more likely to produce extreme results; political participation allows for voice with no need for violent conflict; in democracies groups have fewer incentives to indulge in non-cooperative and disruptive behavior, as no specific group can be excluded from political competition. Rodrik (1998) presents evidence in favor of the hypothesis that countries with poorer institutions tended to suffer the sharpest falls in growth rates after 1975, while Easterly (2001) found that well developed institutions diminish the

¹⁰ As an example, Benson (2003) reports that before 1987 there was one case of insured losses from a natural disaster that exceeded \$1 billion, while by 1995 there were 14 instances.

¹¹ See Benson (2003) and Freeman et al. (2003).

¹² Larger economies (higher absolute population) and richer countries (higher per capita GDP) seem to display lower consumption volatility, which is shown to be positively associated with income volatility.

¹³ The figures for Sub-saharan Africa are similar to those for the Caribbean region, while those for the OECD are the lowest.

¹⁴ This study examines 6 countries in the Caribbean and 10 from Latin America in the period 1970 to 1999 and reports that catastrophic events led to: decline in the growth of output and investment, lower but important declines in consumption growth (with most of the decline in private consumption, corresponding to half of the decline in investment and income), as well as a worsening of the current account balance.

negative economic impact of risk factors such as ethnic diversity. [Hnatkovska and Loayza \(2003\)](#) find that aggregate economic volatility is negatively associated with long-run economic growth. Furthermore, they find that this relation is exacerbated in countries that are poor or display poorly developed institutions.¹⁵ Democracy may thus act as a risk-reducer, if not insofar as incidence, at least in terms of the cost of shocks to economic growth.

In a related argument, specifically connected with the issue of terrorism, [Frey and Luechinger \(2002\)](#) express skepticism when evaluating the benefits of deterrence in the fight against terrorism, arguing instead for increasing the opportunity cost of terrorism. Their anti-terrorism strategy involves an argument for political and economic decentralization. As political power is more thinly distributed across political actors—where the classical division of power is attained through democracy and the rule of law—and across levels of government—through federalism—societies become less vulnerable to terrorism. In addition, the decentralization of decision-making involved in a developed market economy also decreases their vulnerability, in contrast to a regulated and monopolized economy. This argument calls for making the target more “diffuse”, in political and economic terms.

3. Empirics

In this section we attempt to answer the three central questions of the paper. First, what is the incidence of terrorism, namely, what are the country-level indicators associated with a higher likelihood of suffering a terrorist attack? Second, does the incidence of terrorism lead to a decrease in GDP growth, and how important is that cost, quantitatively? Finally, do countries with higher levels of political rights suffer more or less, in economic terms, after a terrorist attack?

We use existing datasets on macroeconomic and institutional indicators for a broad cross-section of countries, in addition to new datasets we have collected on the incidence of terrorism and natural disasters. The macroeconomic data come from the World Development Indicators dataset available as [World Bank \(2003a,b\)](#), which covers most countries and territories. The macroeconomic variables of interest are mainly related to output—per capita GDP and its growth rate—trade—trade intensity and share of primary goods exports—government expenditure—total spending and spending on education—and population—total population and population structure. The institutional data, namely information on political rights, were compiled from [Freedom House \(2003\)](#) and cover most countries in the world between 1972 and 2001.

As far as terrorist attacks are concerned, we have assembled a new dataset based on data provided by the [International Policy Institute for Counter-Terrorism \(2003\)](#). This institution offers data on the type and number of attacks identified by country

¹⁵Recently, [Acemoglu et al. \(2003\)](#) suggest that weak institutions can actually cause macroeconomic volatility through a variety of channels.

and year. Furthermore, it provides information on the target, the number and type of casualties and the nature of the organization behind the attack. Our dataset comprises 1427 registered terrorist incidents, varying widely in type and consequences. We have coded the variables on an annual basis for each country computing the number of terrorist events, their breakdown according to the target—civilian, military or political—, type of perpetrator—known or unknown terrorist organization—and number of casualties—total affected, killed and injured.¹⁶

The dataset on the incidence of natural disasters—earthquakes, floods, hurricanes, as well as other events—is provided by the [Centre for Research on the Epidemiology of Disasters \(2003\)](#) and documents about 6000 occurrences of natural disasters in the world between 1970 and 2002. We have compiled information on the date and country of occurrence, the number of casualties, including the number killed and injured. As for currency crises, we rely on two recent sources, [Bordo et al. \(2001\)](#) and [Kaminsky \(2003\)](#). Both identify episodes of currency crises by country and year. We have noted the country-year observation as a currency crisis if either source has identified it as such. This allows us the maximum number of usable observations since the first source is wider in time coverage and the second in terms of countries covered. However, our results do not change with the use of one or the other indicator in isolation.¹⁷ All sources and description of the variables are presented in the data Appendix. For each specification, we report results for the largest possible sample, which explains different sample sizes as reported, and our results are not sensitive to the sample definition.

3.1. *The incidence of terrorism*

In this section we identify the determinants of the incidence of terrorism using a cross-country dataset for the 1987–2001 period.¹⁸ In contrast with the existing literature, our measure of incidence is the number of terrorist attacks—and their disaggregation by target, organization and casualties—divided by a country's absolute population. [Table 1](#) presents summary statistics for each indicator of terrorism incidence for the sample of 2725 observations and 1428 attacks. As can be verified, the majority of terror attacks are directed at civilian targets. Together, terrorist attacks on military and political targets account for less than half of the attacks on civilian targets. Most terrorist attacks are undertaken by known organizations and, of the total people affected, the number injured is about four times higher than the number killed. All indicators display an extremely high standard deviation, suggesting that a great number of country-year observations have more than one attack to account for. There is indication that natural disasters are more frequent, while currency crises are less frequent than terrorist attacks.

¹⁶We compile and use only terrorism indicators for the years between 1987 and 2001 since data prior to 1987 have not been systematically compiled.

¹⁷Furthermore, and as reported in a previous version of the paper, we have used an indicator of bank or currency crises following [Bordo et al. \(2001\)](#) as an alternative indicator, with similar results.

¹⁸As pointed above the dataset on terrorist attacks is the limiting factor in defining the start date for the sample.

Table 1
Terrorist attacks and other shocks Summary Statistics

| | Mean | Standard deviation |
|--------------------------|------|--------------------|
| Total attacks | 0.57 | 5.99 |
| On civilian targets | 0.40 | 4.75 |
| On military targets | 0.11 | 1.56 |
| On political targets | 0.07 | 0.56 |
| By known organizations | 0.31 | 4.62 |
| By unknown organizations | 0.26 | 2.29 |
| Total affected | 7.17 | 96.90 |
| Killed | 1.48 | 15.00 |
| Injured | 5.68 | 88.20 |
| Natural disasters | 4.24 | 20.60 |
| Currency crises | 0.03 | 0.17 |

Note: The number of observations is 2725 and the number of attacks 1428. All statistics are yearly averages of occurrences per 10 million inhabitants, between 1987 and 2001.

Table 2 examines the determinants of terrorist attacks in our sample. Our main interest is to determine whether democracies, i.e. countries with a high level of political rights, are more likely to suffer an attack. The main determinants investigated are the country's level of income per capita, the growth rate of per capita GDP, an indicator of political rights, the share of primary goods exports in GDP, indicators of ethnic, language and religious diversity, the share of urban population, the share of population younger than 15 and the occurrence of illiteracy in adult males. As can be verified, all indicators of incidence use information on the victim country. The set of control variables restricts the number of usable observations. The specification is thus

$$\begin{aligned} \text{Terrorism Incidence}_{i,t} = & \beta_0 + \beta_1.\text{pcGDP}_{i,t} + \beta_2.\text{GrowthGDP}_{i,t} \\ & + \beta_3.\text{Political Rights}_{i,t} + \text{Additional Controls} + \varepsilon_{i,t}. \end{aligned} \quad (1)$$

One must first note the low *R* square associated with the specification. In other words, all these aggregate indicators explain but a small fraction of the variation in terrorism victimization at country level, varying between 2 and 10 percent of the total variation. We use ordinary least-squares regression as the estimation method but have also undertaken truncated regression analysis to account for truncation in the incidence of terrorism. Since, as reported below, results do not differ substantially and the sample size is dramatically decreased we have decided not to report the full results here.

As we examine the significance of the coefficients on the right-hand side variable, a few patterns emerge. We confirm previous results showing that a positive association between the level of per capita income on the incidence of terrorism. Higher levels of income per capita tend to be associated with higher incidence in all cases except military and political targets and attacks by unknown organizations. In other words, the most frequent types of attack—on civilian targets by known organization—are more likely to occur in rich countries. In the case of total terrorist attacks, as an

Table 2

The incidence of terrorism—Ordinary least squares. Dependent variable: terrorist attacks, by type of target, terrorist organization, and number of victims

| | Dependent variable | | | | | | | | |
|------------------------|-------------------------|--------------------|---------------------|-------------------|---------------------------|-------------------|----------------------|--------------------|---------------------|
| | Total terrorist attacks | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| GDP per capita | 0.090** (2.68) | 0.08** (2.91) | 0.01 (1.47) | 0.00 (−0.08) | 0.07** (3.17) | 0.02 (1.46) | 1.620** (2.32) | 0.21** (2.01) | 1.410** (2.28) |
| GDP growth | 0.022** (2.04) | 0.019* (1.89) | 0.001 (0.45) | 0.002 (1.02) | 0.004 (0.75) | 0.018* (1.89) | −0.050 (−0.19) | 0.039 (1.39) | −0.089 (−0.35) |
| Political rights | 0.110 (0.18) | −0.029 (−0.40) | −0.012* (−1.94) | 0.025 (1.40) | −0.068** (−2.38) | 0.052 (0.74) | −1.130 (−1.22) | −0.148 (−0.85) | −0.979 (−1.21) |
| Primary goods exporter | −0.401 (−0.68) | −0.200 (−0.35) | −0.100* (−1.99) | −0.100 (−1.11) | −0.400* (−1.87) | 0.010 (−0.08) | −11.000 (−1.59) | −0.600 (−0.43) | −10.400* (−1.70) |
| Ethnic diversity | −0.570 (−1.34) | −0.537 (−1.59) | −0.189** (−2.68) | 0.125 (0.92) | −0.467* (−1.86) | −0.133 (−0.54) | −15.500* (−1.70) | −2.330* (−1.69) | −13.100 (−1.61) |
| Linguistic diversity | 1.750** (2.87) | 1.530** (2.94) | 0.190** (2.13) | 0.048 (0.51) | 1.040** (2.95) | 0.728** (2.14) | 38.000** (2.99) | 5.690** (3.12) | 32.300** (2.84) |
| Religious diversity | −0.681 (−1.60) | −0.576* (−1.72) | −0.046 (−1.09) | −0.046 (−0.32) | −0.581*** (−4.13) | −0.087 (−0.25) | −4.630 (−0.65) | −1.960* (−2.09) | −2.670 (−0.40) |
| Illiteracy adult males | −1.140* (−1.81) | −0.900* (−1.67) | −0.100** (−2.15) | −0.100 (−0.86) | −0.800** (−2.93) | −0.400 (−0.78) | −48.900 (−1.61) | −5.00** (−2.29) | −43.900 (−1.53) |

Table 2 (continued)

| | Dependent variable | | | | | | | | |
|----------------------------|-------------------------|-------------------|-------------------|-------------------|---------------------------|-------------------|----------------------|-------------------|---------------------|
| | Total terrorist attacks | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| Urban population | 2.760** (2.61) | 2.000** (2.33) | 0.300** (2.78) | 0.500* (1.79) | 1.000** (2.82) | 1.700** (2.12) | 21.500* (1.67) | 4.900** (2.25) | 16.500 (1.44) |
| Population younger than 15 | 3.77 (1.56) | 3.40* (1.64) | 0.700** (2.55) | −0.300 (−0.59) | 3.00** (2.62) | 0.800 (0.48) | 120.000** (2.29) | 12.100* (1.86) | 107.000** (2.24) |
| Number of Obs. | 964 | 964 | 964 | 964 | 964 | 964 | 964 | 964 | 964 |
| R ² | 0.044 | 0.043 | 0.048 | 0.019 | 0.095 | 0.021 | 0.030 | 0.041 | 0.027 |

Note: *t*-stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

example, the coefficient suggests that an increase of one thousand constant 1995 US Dollars is associated with an increase of 0.09 in attacks and 1.62 in casualties per 10 million inhabitants.¹⁹ The results on growth are less clear but periods of higher growth are weakly associated with higher vulnerability to attacks, especially against civilian targets.

Countries with a higher degree of political development, as captured by a higher indicator of political rights, are not more likely to suffer an attack. If anything, after controlling for the other determinants of terrorist incidence, more democratic countries are less likely to suffer attacks on military targets and by known organizations.²⁰ Our data do not support the hypothesis that more democratic regimes are especially vulnerable to terrorism.

Countries that are primary goods exporters do not seem to suffer from increased vulnerability to attack, as attested by the negative sign of the only two coefficients that are statistically significant. Ethnic, linguistic and religious diversity are, by contrast, more closely associated with terrorism incidence. The diversity variables measure the probability that two individuals randomly drawn from the population will identify with different religions or ethnic groups or use different languages, and ranges from 0 to 100 percent. Linguistic diversity is positively related to incidence and only in the case of attacks on political targets is the coefficient not significant. An increase of 10 percent in diversity leads to an increase in total attacks of 0.17 and in casualties of 3.8 per 10 million inhabitants. Interestingly, after controlling for linguistic diversity, ethnic and religious diversity seem to have a negative effect on incidence, especially as it relates to attacks on civilian and military targets and total casualties.²¹

Finally, we look at the demographic structure and spatial distribution of the population. As might be expected, a larger share of urban population is positively and significantly associated with higher incidence, with the exception of the number of injuries. This is the prior that one would hold from casual observation, as well as from reading the recent literature on terrorism in cities. Attacks in urban areas may increase the benefit of the attack to the terrorist group—potential damage and visibility—as well as decrease the cost of conducting the action—easier to pass unnoticed before and after the attack. The share of population under 15 years of age, an indicator of an exploding demographic pyramid, with all that it entails in terms of social instability, is also positively and significantly associated with incidence.²²

¹⁹ Truncated regression analysis has yielded the same pattern of positive association between income per capita and incidence.

²⁰ It is also true that in spite of not being significant, the coefficient on political rights is positive for attacks by unknown organizations and of approximately the same size, suggesting some substitution towards anonymous attacks. This may be related to the fact that political regimes with increased legitimacy are less prone to be openly attacked by terrorist groups.

²¹ This result is actually the only one that contrasts with results for truncated variable regression. The use of this alternative estimation method yields that linguistic diversity does not significantly affect the incidence of terrorism, while both ethnic and religious diversity increase it.

²² Both the coefficients, on the share of urban and young population, are associated with positive and significant coefficients in the truncated regression analysis.

3.2. The cost of terrorism

In this section we estimate the impact of terrorist attacks on economic performance as measured by the yearly growth rate in real per capita GDP. We use ordinary least squares and instrumental variables estimation techniques. Growth in real per capita GDP is the left-hand side variable to be explained. On the right-hand side we use lagged GDP per capita growth and the level of income per capita as controls in all specifications. The indicators of aggregate shocks investigated account for terrorist attacks—subdivided into different types—, natural disasters and currency crises. Subsequent specifications include an additional set of control variables so that the specification can be summarized as:

$$\begin{aligned} \text{GrowthGDPpc}_{i,t} = & \beta_0 + \beta_1.\text{Growth GDPpc}_{i,t-1} + \beta_2.\text{GDPpc}_{i,t} \\ & + \beta_3.\text{Terrorism Incidence}_{i,t} + \beta_4.\text{Natural Disaster Incidence}_{i,t} \\ & + \beta_5.\text{Currency Crisis}_{i,t} + \text{Additional Controls} + \varepsilon_{i,t}, \end{aligned} \quad (2)$$

where results in [Tables 3 and 4](#) ignore the additional controls which are then in [Table 5](#). All specifications include time dummies accounting for yearly changes in output growth associated with global fluctuations and standard errors are heteroskedasticity-consistent. As an alternative methodology we estimate the impact of aggregate shocks on a “surprise” component of annual GDP growth, computed as the difference between actual GDP growth and the fitted value of a regression of GDP growth on all its determinants except the shock indicators. As will be evident below, this alternative methodology delivers the same results as far as the influence of each aggregate shock on GDP growth.

[Table 3](#) uses the simplest specification, with the output-related control variables and the three indicators of aggregate shocks. We find that lagged growth in per capita GDP is positively and very significantly related to current GDP growth. As to the indicators of aggregate shocks, the incidence of terrorism comes out with a negative and significant effect when either total attacks, or total casualties, attacks on civilian or military targets or by known organizations and the right-hand side indicator of terrorism incidence. Attacks on civilians and the military by known organizations seem to be the most detrimental to economic growth. As to other shocks, the occurrence of natural disasters comes out as having a negative and significant effect in all specifications, while a currency crisis—though less frequent, as we have seen—has a negative and very significant impact on current economic growth. The level of the *R* squared suggests that the specification explains a substantial fraction of the growth fluctuations.

A possibility that needs to be explicitly taken into account is that the incidence of terrorism is measured with error. There is no single definition of terrorism and some countries may be, for different reasons, likely to under report or otherwise bias the data on the incidence of terrorism. For this reason we have estimated an error-in-variables regression model in the case of the specification in [Tables 3 and 5](#). To obtain estimates we assumed a value for the share of noise variance over total

Table 3
The cost of terrorism—Ordinary least squares. Dependent variable: growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total Affected | Killed | Injured |
| Lagged pcGDP growth | 0.423** (9.36) | 0.423** (9.36) | 0.424** (9.37) | 0.424** (9.38) | 0.423** (9.36) | 0.424** (9.37) | 0.424** (9.38) | 0.424** (9.38) | 0.424** (9.38) |
| pcGDP | 0.022** (2.66) | 0.022** (2.67) | 0.021** (2.59) | 0.022** (2.62) | 0.022** (2.66) | 0.022** (2.62) | 0.022** (2.67) | 0.022** (2.64) | 0.022** (2.66) |
| Terrorism indicator | −0.045** (−3.35) | −0.055** (−4.19) | −0.181** (−2.29) | 0.082 (0.70) | −0.070** (−5.48) | −0.012 (−0.26) | −0.001* (−1.88) | −0.010 (−1.35) | −0.001 (−1.62) |
| Natural disasters | −0.006* (−1.82) | −0.006* (−1.81) | −0.006* (−1.81) | −0.006* (−1.75) | −0.006* (−1.81) | −0.006* (−1.77) | −0.006* (−1.78) | −0.006* (−1.80) | −0.006* (−1.78) |
| Currency crisis | −1.410** (−2.46) | −1.409** (−2.46) | −1.413** (−4.70) | −1.405** (−2.45) | −1.406** (−2.45) | −1.408** (−2.46) | −1.411** (−2.46) | −1.409** (−2.46) | −1.410** (−2.46) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 |
| R ² | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |

Note: *t*- stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

Table 4

The cost of terrorism—Instrumental variable estimates. Dependent variable: growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total Affected | Killed | Injured |
| Lagged pcGDP growth | 0.423** (9.38) | 0.423** (9.38) | 0.423** (9.36) | 0.423** (9.16) | 0.423** (9.38) | 0.424** (9.38) | 0.424** (9.37) | 0.424** (9.38) | 0.424** (9.37) |
| pcGDP | 0.022** (2.66) | 0.022** (2.67) | 0.021** (2.53) | 0.019** (2.00) | 0.022** (2.65) | 0.022** (2.64) | 0.022** (2.67) | 0.022** (2.66) | 0.022** (2.62) |
| Terrorism indicator | −0.038** (−2.21) | −0.047** (−2.89) | −0.031** (−3.83) | 0.016 (0.50) | −0.049** (−2.92) | −0.048 (−0.82) | −0.001 (−0.20) | −0.024* (−1.85) | −0.0005 (−0.13) |
| Natural disasters | −0.006* (−1.81) | −0.006* (−1.80) | −0.006* (−1.84) | −0.005 (−1.38) | −0.006* (−1.80) | −0.006* (−1.78) | −0.006* (−1.77) | −0.006* (−1.85) | −0.006* (−1.75) |
| Currency crisis | −1.410** (−2.46) | −1.410** (−2.46) | −1.418** (−2.47) | −1.369** (−2.39) | −1.406** (−2.45) | −1.412** (−2.46) | −1.409** (−2.46) | −1.412** (−2.46) | −1.404** (−2.45) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 | 2418 |
| R ² | 0.23 | 0.23 | 0.23 | 0.21 | 0.23 | 0.23 | 0.23 | 0.23 | 0.23 |

Note: *t*- stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

Table 5

The cost of terrorism—Ordinary least squares. Dependent variable: growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total Affected | Killed | Injured |
| Lagged pcGDP growth | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) | 0.262** (4.91) |
| PcGDP | 0.016 (1.19) | 0.016 (1.19) | 0.017 (1.22) | 0.016 (1.19) | 0.017 (1.20) | 0.016 (1.19) | 0.017 (1.20) | 0.016 (1.20) | 0.017 (1.20) |
| Terrorism indicator | 0.010 (0.37) | 0.008 (0.27) | 0.312* (1.85) | 0.044 (0.32) | 0.084* (1.75) | −0.003 (−0.13) | 0.0004 (0.33) | 0.004 (0.37) | 0.0003 (0.31) |
| Natural disasters | −0.057** (−2.21) | −0.057** (−2.21) | −0.057** (−2.24) | −0.056** (−2.21) | −0.056** (−2.20) | −0.057** (−2.22) | −0.057** (−2.22) | −0.057** (−2.21) | −0.057** (−2.22) |
| Currency crisis | −2.150** (−3.11) | −2.150** (−3.11) | −2.136** (−3.08) | −2.149** (−3.11) | −2.141** (−3.09) | −2.151** (−3.11) | −2.149** (−3.11) | −2.149** (−3.11) | −2.150** (−3.11) |
| Scale | 0.031** (4.76) | 0.031** (4.76) | 0.031** (4.74) | 0.032** (4.76) | 0.031** (4.75) | 0.031** (4.76) | 0.031** (4.76) | 0.032** (4.76) | 0.031** (4.76) |
| Openness | 0.026** (3.98) | 0.026** (3.98) | 0.027** (4.03) | 0.026** (3.97) | 0.027** (4.02) | 0.026** (3.98) | 0.026** (4.00) | 0.026** (3.99) | 0.026** (4.00) |
| Inflation | −0.001** (−2.05) | −0.001** (−2.05) | −0.001** (−2.02) | −0.001** (−2.05) | −0.001** (−2.05) | −0.001** (−2.05) | −0.001** (−2.05) | −0.001** (−2.05) | −0.001** (−2.05) |
| Primary goods exporter | −0.015* (−1.93) | −0.015* (−1.93) | −0.015* (−1.89) | −0.015* (−1.93) | −0.015* (−1.93) | −0.015* (−1.91) | −0.015* (−1.92) | −0.015* (−1.93) | −0.015* (−1.92) |

Table 5 (continued)

| | Right-hand side terrorism indicator | | | | | | | | |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total Affected | Killed | Injured |
| Government size | −0.041** (−2.56) | −0.041** (−2.56) | −0.043** (−2.63) | −0.041** (−2.56) | −0.042** (−2.63) | −0.041** (−2.55) | −0.041** (−2.56) | −0.041** (−2.56) | −0.041** (−2.56) |
| Education expenditure | −0.128 (−1.20) | −0.128 (−1.20) | −0.132 (−1.23) | −0.128 (−1.20) | −0.132 (−1.23) | −0.128 (−1.20) | −0.130 (−1.21) | −0.129 (−1.21) | −0.129 (−1.21) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | 695 | 695 | 695 | 695 | 695 | 695 | 695 | 695 | 695 |
| R ² | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |

Note: *t*-stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

variance.²³ In the case of [Table 3](#) we have found that the result of a negative and significant effect of terrorism incidence on GDP growth survives very high levels of measurement error in the terrorism indicator variables, well below 50 percent.

[Table 4](#) conducts the same empirical exercise but uses instrumental variables to correct for the possible endogeneity of terrorism attacks. As [Table 2](#) had suggested, growth is not a major determinant of the occurrence of terror attacks, so that we would not expect endogeneity to be a major concern. We instrument for terrorist attacks with its lagged value.²⁴ The results of [Table 3](#) are largely confirmed, even though the size of the coefficients tends to decrease slightly. With the exception of the number killed, which becomes the relevant indicator as far as casualties in lieu of the total affected, all other indicators of terrorism incidence remain significantly and negatively associated with growth. Terrorism has an immediate negative impact on growth and this impact is strongest for attacks on civilian targets conducted by known organizations. Natural disasters and currency crises remain important determinants of current GDP growth.

[Fig. 1](#) illustrates the impact on economic growth of each terrorism indicator as well as the other shock indicators. The size of each bar indicates the impact on the growth of real per capita GDP of a one-standard deviation change in each indicator of aggregate shocks, obtained as the product of the coefficient in [Table 3](#) by the standard deviation of the variable in the sample. This cost estimate weighs both the frequency of each shock and, once it has occurred, its impact on economic growth. We confirm our previous suggestion that the attacks on civilian and military targets impose the greatest potential damage, a decrease of about 0.25 percent in GDP growth. Attacks by known organizations decrease growth by slightly more than 0.30 percent. These cost estimates, though arguably small, are comparable to the estimated cost of a currency crisis and much larger than the impact of a natural disaster.

[Table 5](#) estimates the impact of terrorism on growth after additional determinants of growth are taken into account. The additional controls are the country's population—to control for scale effects—, the degree of trade openness, the rate of inflation, the share of primary goods exports in merchandise exports, the size of government measured as the share of government spending in GDP and the share of government spending in education. These variables capture most of the economic indicators shown to be associated with economic growth in cross-country growth empirics. We find that after controlling for the additional determinants of economic growth, the incidence of terrorism actually becomes insignificant.²⁵ This contrasts

²³Independent variables for which no reliability is explicitly assumed are taken as measured without error. We have only exploited the sensitivity of the results to changes in the reliability with which the incidence of terrorism is measured.

²⁴So that, for instance, the number of terrorist attacks on civilian targets is instrumented for with the exact same variable lagged one period. We also tried instrumenting with terrorist attacks 5 years before and the results were quite similar.

²⁵The errors-in-variables model estimates of the impact of terrorism still deliver a non-significant coefficient of terrorism incidence on GDP per capita growth when additional determinants of growth are taken into account.

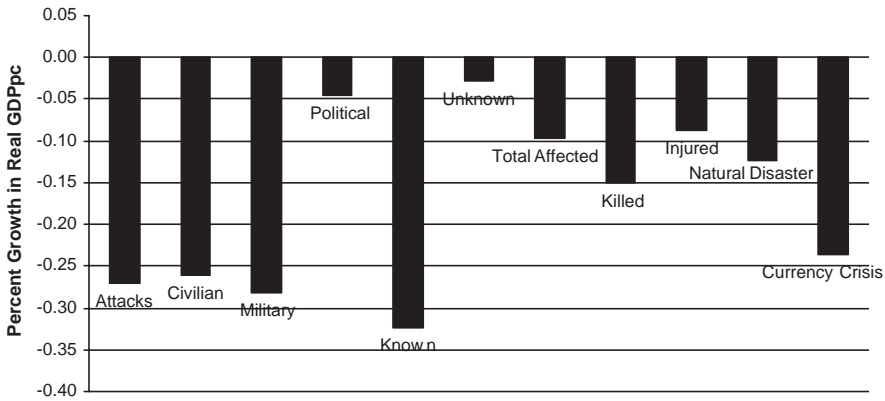


Fig. 1. Terrorism, shocks, natural disasters and economic growth.

with the estimate of the impact of natural disasters and currency crises on growth, which remain significant and see their estimated coefficient increase.

As to the other variables, scale and openness are positively and significantly related to income growth. The impact of scale is quantitatively small, with an increase of 10 million people leading to a change of 0.03 in annual growth rates. The coefficient of the openness indicator, on the other hand, suggests that a 10 percent increase in the share of exports in GDP leads to a 0.26 increase in growth rates. Inflation, the share of primary goods exports and the size of government are all negatively associated with income growth, while the share of spending on public education is not significantly associated with growth. In sum, after taking into account additional determinants of income growth, the evidence suggests that natural disasters and currency crises impact growth, but not terrorism.

Table 6 presents estimates of the impact of each aggregate shock indicator—terrorism, natural disasters and currency crises—on growth by using as variable to be explained the difference between the actual and fitted values of yearly growth rates. We find that the results in Table 5 are overwhelmingly confirmed: the incidence of terrorism does not seem to affect growth while natural disasters and currency crises do so significantly. Moreover, the size of the coefficients associated with non-terrorism shocks is very close to the estimated values in Table 5.

3.3. Political rights and the cost of terrorism

We now turn to the relationship between the level of political rights of the victim country and the cost associated with terrorist attacks. As we have seen above, and contrary to expectations, countries that are more democratic are not more prone to terror attacks, after other aggregate indicators are controlled for. A different issue is whether the cost of a terrorist attack, *once* it occurs, implies a different economic cost in countries with a higher level of political rights. Table 7

Table 6

The Cost of terrorism—Ordinary least squares. Dependent variable: “Unpredicted” growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| Terrorism indicator | 0.005 (0.25) | 0.003 (0.14) | 0.176 (1.20) | 0.034 (0.30) | 0.054 (1.40) | −0.005 (−0.26) | 0.000 (0.10) | 0.002 (0.20) | 0.0001 (0.08) |
| Natural disasters | −0.052** (−2.06) | −0.052** (−2.07) | −0.052** (−2.08) | −0.052** (−2.06) | −0.052** (−2.06) | −0.052** (−2.07) | −0.052** (−2.07) | −0.052** (−2.06) | −0.052** (−2.07) |
| Currency crisis | −1.933** (−2.93) | −1.934** (−2.93) | −1.927** (−2.92) | −1.932** (−2.93) | −1.925** (−2.92) | −1.936** (−2.93) | −1.934** (−2.93) | −1.933** (−2.93) | −1.934** (−2.93) |
| Number of observations | 695 | 695 | 695 | 695 | 695 | 695 | 695 | 695 | 695 |
| R^2 | 0.02 | 0.02 | 0.03 | 0.02 | 0.03 | 0.02 | 0.02 | 0.02 | 0.02 |
| Prob > F | 0.0055 | 0.0057 | 0.0023 | 0.0054 | 0.0019 | 0.0058 | 0.0057 | 0.0056 | 0.0058 |

Note: The dependent variable, Unpredicted growth in real GDP per capita is computed as the difference between actual growth in Real GDP per capita and the predicted value of a regression of this variable on all the right-hand side variables in Table 5, except the three indicators of shocks—terrorist attacks, natural disasters and currency crisis. t -stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

Table 7

Political rights and the cost of terrorism—Ordinary least squares. Dependent variable: growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|--|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| Lagged pcGDP growth | 0.261** (4.80) | 0.262** (4.81) | 0.262** (4.82) | 0.258** (4.74) | 0.261** (4.80) | 0.260** (4.78) | 0.261** (4.80) | 0.261** (4.79) | 0.261** (4.81) |
| pcGDP | 0.017 (1.20) | 0.0168 (1.19) | 0.0163 (1.15) | 0.0168 (1.19) | 0.0166 (1.18) | 0.0173 (1.22) | 0.0167 (1.18) | 0.0168 (1.20) | 0.0166 (1.17) |
| Terrorism indicator | −0.029** (−2.89) | −0.033** (−2.61) | −1.390** (−0.90) | −0.186** (−3.26) | −0.140** (−1.84) | −0.042** (−3.30) | −0.007** (−3.74) | −0.020** (−3.04) | −0.008** (−3.59) |
| Terrorism indicator* Political rights | 0.121** (3.15) | 0.121** (2.89) | 1.910 (1.07) | 0.702** (3.37) | 0.276** (2.84) | 0.246** (2.84) | 0.017** (3.42) | 0.053** (2.46) | 0.020** (3.33) |
| Natural disasters | −0.055** (−2.13) | −0.054** (−2.12) | −0.055** (−2.16) | −0.054** (−2.11) | −0.055** (−2.13) | −0.054** (−2.12) | −0.055** (−2.15) | −0.054** (−2.13) | −0.055** (−2.14) |
| Currency crisis | −2.105 (−3.03) | −2.111 (−3.04) | −2.109 (−3.03) | −2.108 (−3.04) | −2.105 (−3.03) | −2.106 (−3.03) | −2.109 (−3.04) | −2.113 (−3.04) | −2.111 (−3.04) |
| Scale | 0.032** (4.87) | 0.032** (4.87) | 0.032** (4.85) | 0.032** (4.90) | 0.032** (4.86) | 0.032** (4.89) | 0.032** (4.85) | (4.88) | 0.032** (4.85) |
| Openness | 0.026** (4.00) | 0.026** (3.98) | 0.026** (3.94) | 0.026** (3.95) | 0.026** (3.98) | 0.026** (3.99) | 0.026** (4.00) | 0.026** (3.98) | 0.026** (3.99) |

| | | | | | | | | | |
|------------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|---------------------|
| Inflation | −0.001** (−2.02) | −0.001** (−2.02) | −0.001** (−2.02) | −0.001** (−2.07) | −0.001** (−2.02) | −0.001** (−2.01) | −0.001** (−2.02) | −0.001** (−2.02) | −0.001** (−2.02) |
| Primary goods exporter | −0.014* (−1.68) | −0.014* (−1.71) | −0.014* (−1.76) | −0.014* (−1.69) | −0.014* (−1.66) | −0.014* (−1.69) | −0.014* (−1.72) | −0.014* (−1.69) | −0.014* (−1.75) |
| Government Size | −0.043** (−2.65) | −0.042** (−2.60) | −0.041** (−2.54) | −0.042** (−2.62) | −0.043** (−2.63) | −0.042** (−2.62) | −0.042** (−2.63) | −0.041** (−2.57) | −0.042** (−2.62) |
| Education expenditure | −0.119 (−1.10) | −0.118 (−1.08) | −0.112 (−1.04) | −0.112 (−1.04) | −0.117 (−1.08) | −0.120 (−1.11) | −0.122 (−1.12) | −0.117 (−1.08) | −0.121 (−1.11) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | 676 | 676 | 676 | 676 | 676 | 676 | 676 | 676 | 676 |
| R ² | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |

Note: *t*-stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

reproduces the specification in Table 5 except that it adds an additional right-hand side variable: the terrorism incidence indicator interacted with the level of political rights. That is, terrorism incidence enters both as an indicator by itself and interacted with political rights. Since a higher value of the political rights indicator in our sample indicates a higher level of civil liberties and more developed democratic institutions, we interpret the sign on the interaction accordingly: a positive sign of its coefficient suggests that the cost of a given terrorist attack for democracies is lower than for non-democracies. This is precisely what we obtain in Table 7. While all indicators of the incidence of an attack are associated with a statistically and economically significant decrease in the growth rate, the interaction of each of these indicators with the political rights indicator is always positive and, with one exception, significant. In other words, we find evidence that democracies suffer less, economically, after a terrorist attack.²⁶

Fig. 2 plots the effect of a given terrorist event for different levels of political rights. It is obtained as the sum of the coefficient on the terrorism indicator with the coefficient on the interaction divided by the average level of political rights and then multiplied by different levels of political rights, denoted in the x -axis. We report the cost of an attack, an attack on civilian targets, an attack perpetrated by known organizations and the total people affected. All lines have a positive slope, as we would expect from the coefficient signs in Table 7. We find that for Total Terrorist Attacks and for Civilian Attacks the line is very close zero, denoting a weak effect on growth overall. For Attacks by Known Organizations the line fluctuates from -0.15 to -0.1 and for Total Affected the graph line is steep and takes values between 0 and 0.1 depending on the level of political rights. This figure illustrates the conclusion from Table 3 that it is the number of attacks rather than the number of casualties that seems to matter for GDP growth.

As before, we estimate the relation between political institutions and the cost of terrorism using the alternative measure of GDP growth. In Table 8 we present estimates of the cost of terrorism and how it changes with political rights when the “surprise” change in GDP growth is the variable to be explained. The results in Table 7 are overwhelmingly confirmed, with all terrorism indicators being associated with a cost in terms of GDP growth that decreases with political rights.

Table 9 presents another alternative specification where, instead of using the terrorist indicator and adding the interacted variable, we use two new variables: the first is the value of the terrorism incidence indicator when political rights are below or equal to 0.5 and the second is the same variable if political rights are above 0.5.²⁷

²⁶ Assuming there is error in measuring the incidence of terrorism we find that, at levels of reliability between 1 and 0.86, the coefficient on terrorism incidence is still negative and the one on the interaction between incidence and political rights is still positive. However, both coefficients become non-significant.

²⁷ The mean of political rights in our sample is 0.53, in a 0 to 1 range.

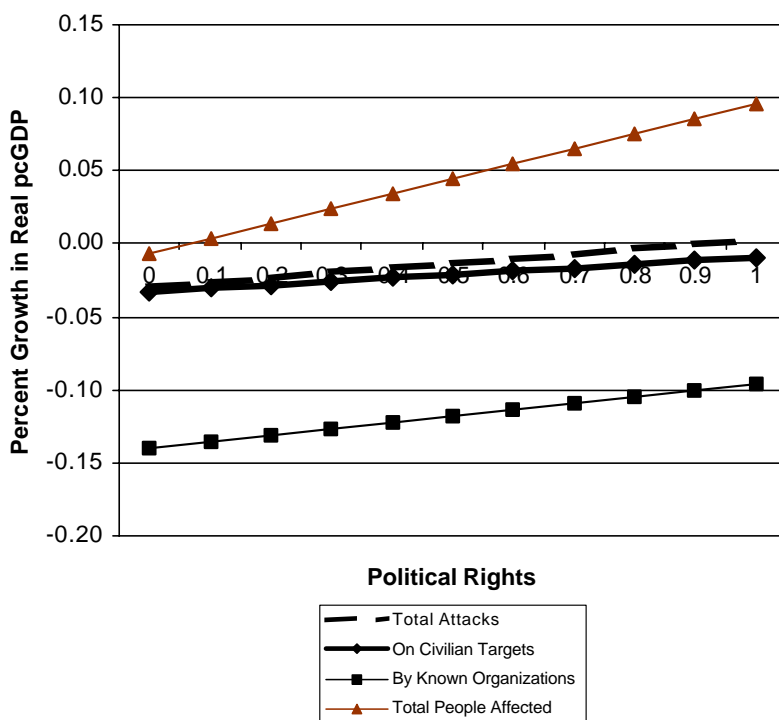


Fig. 2. Political rights and the impact of terrorism on economic growth.

Thus, for a given country and year, only one of these two variables takes the value of the indicator of terrorism incidence, the other necessarily taking the value 0. The results confirm those in Table 7: the higher the level of political rights, the lower the cost of terrorism. The signs of the coefficients of the low political rights victims are negative and significant, whereas the sign of the coefficients of the high political rights victims are positive and significant. The only exception is the indicator number of people killed in the attacks. So, also in this specification, we find that countries that display low levels of political rights incur a higher economic cost after a terrorist attack.

4. Conclusion

Our paper attempts a first systematic answer to three questions. First, what are the main determinants of terrorism incidence, measured in terms of number of events, type of attack and casualties per population. We confirm previous findings that richer countries are more vulnerable to terrorist attacks. A young population

Table 8

Political rights and the cost of terrorism—Ordinary least squares. Dependent variable: “Unpredicted” growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|--|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| Terrorism indicator | −0.022** (−4.28) | −0.024** (−3.55) | −1.860 (−1.41) | −0.148** (−4.60) | −0.108** (−2.31) | −0.030** (−4.43) | −0.005** (−3.58) | −0.016** (−3.79) | −0.006** (−3.28) |
| Terrorism indicator* Political rights | 0.082** (2.73) | 0.080** (2.42) | 2.300 (1.48) | 0.556** (2.98) | 0.204** (3.27) | 0.152** (2.06) | 0.013** (3.05) | 0.039** (2.32) | 0.015** (2.88) |
| Natural disasters | −0.051** (−1.98) | −0.051** (−1.98) | −0.051** (−2.02) | −0.050* (−1.97) | −0.051** (−1.98) | −0.051** (−1.98) | −0.051** (−2.00) | −0.051** (−1.98) | −0.051** (−2.00) |
| Currency crisis | −1.913** (−2.90) | −1.918* (−2.90) | −1.919** (−2.90) | −1.913** (−2.90) | −1.913** (−2.89) | −1.915** (−2.90) | −1.911** (−2.89) | −1.918** (−2.90) | −1.911** (−2.89) |
| Number of observations | 676 | 676 | 676 | 676 | 676 | 676 | 676 | 676 | 676 |
| R ² | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 | 0.03 |
| Prob > F | 0.0000 | 0.0001 | 0.0039 | 0.0000 | 0.0002 | 0.0000 | 0.0000 | 0.0000 | 0.0000 |

Note: The dependent variable, unpredicted growth in Real GDP per capita is computed as the difference between actual Growth in Real GDP per capita and the predicted value of a regression of this variable on all the right-hand side variables in Table 5, except the three indicators of shocks—terrorist attacks, natural disasters and currency crisis. *t*-stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

Table 9

Political rights and the cost of terrorism—Ordinary least squares. Dependent variable: growth in real per capita GDP

| | Right-hand side terrorism indicator | | | | | | | | |
|-----------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| Lagged pcGDP growth | 0.259** (4.86) | 0.260** (4.87) | 0.261** (4.90) | 0.256** (4.79) | 0.260** (4.87) | 0.259** (4.84) | 0.259** (4.87) | 0.259** (4.86) | 0.260** (4.87) |
| PcGDP | 0.017 (1.24) | 0.017 (1.23) | 0.017 (1.20) | 0.017 (1.22) | 0.017 (1.22) | 0.017 (1.25) | 0.017 (1.21) | 0.017 (1.21) | 0.017 (1.21) |
| Terrorism indicator* | -0.023** (-2.61) | -0.026** (-2.20) | -3.650** (-0.84) | -0.170** (-3.33) | -0.142** (-2.50) | -0.027** (-2.43) | -0.001** (-2.11) | -0.011 (-1.48) | -0.001** (-2.32) |
| Low political rights dummy | | | | | | | | | |
| Terrorism indicator * | 0.088** (2.84) | 0.084** (2.47) | 0.318* (1.88) | 0.557** (2.57) | 0.130** (2.81) | 0.185** (2.60) | 0.010** (3.16) | 0.026 (1.34) | 0.012** (3.13) |
| High Political rights dummy | | | | | | | | | |
| Natural disasters | -0.056** (-2.22) | -0.057** (-2.22) | -0.057** (-2.24) | -0.056** (-2.20) | -0.057** (-2.22) | -0.057** (-2.23) | -0.057** (-2.23) | -0.057** (-2.23) | -0.057** (-2.23) |
| Currency crisis | -2.136** (-3.08) | -2.138** (-3.09) | -2.139** (-3.08) | -2.137** (-3.09) | -2.133** (-3.08) | -2.132** (-3.08) | -2.138** (-3.09) | -2.146** (-3.10) | -2.137** (-3.09) |
| Scale | 0.032** (4.77) | 0.032** (4.76) | 0.031** (4.75) | 0.032** (4.79) | 0.031** (4.76) | 0.032** (4.78) | 0.031** (4.75) | 0.032** (4.77) | 0.031** (4.74) |
| Openness | 0.027** (4.08) | 0.027** (4.06) | 0.026** (4.00) | 0.027** (4.04) | 0.027** (4.07) | 0.027** (4.06) | 0.027** (4.08) | 0.027** (4.04) | 0.027** (4.07) |
| Inflation | -0.001** (-2.03) | -0.001** (-2.03) | -0.001** (-2.02) | -0.001** (-2.10) | -0.001** (-2.05) | -0.001** (-2.02) | -0.001** (-2.03) | -0.001** (-2.03) | -0.001** (-2.03) |

Table 9 (continued)

| | Right-hand side terrorism indicator | | | | | | | | |
|------------------------|-------------------------------------|---------------------|---------------------|---------------------|---------------------------|---------------------|----------------------|---------------------|---------------------|
| | Total terrorist attack | By type of target | | | By terrorist organization | | By number of victims | | |
| | | Civilian | Military | Political | Known | Unknown | Total affected | Killed | Injured |
| Primary goods exporter | −0.014* (−1.78) | −0.014* (−1.80) | −0.014* (−1.77) | −0.014* (−1.78) | −0.014* (−1.73) | −0.014* (−1.79) | −0.015* (−1.85) | −0.014* (−1.82) | −0.015* (−1.86) |
| Government size | −0.044** (−2.70) | −0.043** (−2.65) | −0.042** (−2.61) | −0.043** (−2.70) | −0.043** (−2.69) | −0.043** (−2.67) | −0.043** (−2.70) | −0.042** (−2.61) | −0.043** (−2.70) |
| Education expenditure | −0.141 (−1.31) | −0.139 (−1.29) | −0.132 (−1.23) | −0.132 (−1.25) | −0.140 (−1.30) | −0.140 (−1.30) | −0.141 (−1.31) | −0.134 (−1.26) | −0.141 (−1.31) |
| Time dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Number of observations | 695 | 695 | 695 | 695 | 695 | 695 | 695 | 695 | 695 |
| R ² | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 | 0.25 |

Note: *t*-stats in parentheses using heteroskedastic-consistent standard errors.

***Denote significant at the 10 and 5 percent significance levels, respectively.

Variables and units described in the Data Appendix.

concentrated in urban areas also increases the risk of terrorism. Interestingly, the level of political rights is not significantly associated with terrorism incidence. In other words, after controlling for the level of personal income, democracies are not especially vulnerable to terror.

The second question is whether a terrorist attack affects the rate of economic growth. We find some evidence that it does and this impact may be on the order of 0.2 percent for a change in terrorism incidence equivalent to the standard deviation observed in the sample. Attacks on civilians by known terrorist organizations seem to impose the greatest cost in terms of output and, more generally, the occurrence of attacks rather than the number of victims seems to matter. However, when additional controls are taken into account, terrorism does not have a significant impact on growth, whereas the occurrence of natural disasters and currency crises remain important.

A possible explanation for the above result is associated with the third question we address, namely, do democracies suffer more or less in growth terms once they suffer an attack? We find that countries with higher levels of political rights do suffer smaller output costs immediately following terrorist attacks.

We believe this paper contributes to further the understanding the determinants and costs of terrorist attacks. We have concentrated on the immediate cost in the aftermath of attacks. The newly assembled dataset covering a wide number of countries over time and the use of different incidence indicators, as well as the comparison with other aggregate shocks, strongly suggests that democracies are not especially targeted by terrorists. In democracies, terrorism still imposes an economic cost, albeit smaller than in non-democracies.

Appendix. Data

Terrorism Incidence—Source: International Policy Institute for Counter-Terrorism (2003). *Definition*: Number of attacks or casualties per 10 million inhabitants. Incidence is computed as Total Terrorist Attacks, by Target—Civilian, Military and Political—, by Terrorist Organization—Known or Unknown—and by Casualties—Total, Killed and Injured. *Unit*: Units per 10 million inhabitants.

Natural disasters Source: Centre for Research on the Epidemiology of Disasters (2003). *Definition*: Number of natural disasters per 10 million inhabitants. **Unit**: Units per 10 million inhabitants.

Currency Crisis—Source: Bordo et al. (2001) and Kaminsky (2003). *Definition*: Dummy variable taking the value 1 if a currency crisis is reported. We have noted as 1 any date for which either source identifies a currency crisis and 0 otherwise. *Unit*: Dummy that takes values 0 or 1.

GDP per capita—Source: World Bank (2003a,b). *Definition*: Real per capita GDP in constant 1995 United States Dollars. *Unit*: Thousands of dollars.

GDP growth—Source: World Bank (2003a,b). *Definition*: Growth in real GDP. *Unit*: Percent.

Political rights—Source: Freedom House (2003). *Definition*: Indicator of political rights, transformed so an increase denotes more political rights. *Unit*: Between 0 and 1.

Primary Goods Exporter— Source: World Bank (2003a,b). *Definition*: Share of primary goods exports as share of total merchandise exports. *Unit*: Between 0 and 1.

Ethnic, linguistic and religious diversity—source: Alesina et al. (2003). *Definition*: Probability that a random draw of two persons from the same country will result in different ethnic groups, mother tongue or religious affiliation. For each country the value is constant and refers to the late 1990s. *Unit*: Between 0 and 1.

Illiteracy adult males—source: World Bank (2003a,b). *Definition*: Illiteracy rate of adult male individuals (above 15 years of age). *Unit*: Between 0 and 1.

Urban Population—source: World Bank (2003). *Definition*: Share of the population living in urban areas. *Unit*: Between 0 and 1.

Population younger than 15—source: World Bank (2003a,b). *Definition*: Share of the population that is younger than 15 years of age. *Unit*: Between 0 and 1.

Scale—Source: World Bank (2003a,b). *Definition*: Country population. *Unit*: Tens of million.

Openness—source: World Bank (2003a,b). *Definition*: Export of goods and services. *Unit*: Percent.

Inflation—source: World Bank (2003a,b). *Definition*: Change in consumer prices. *Unit*: Percent.

Government size—source: World Bank (2003a,b). *Definition*: Total government expenditure as a share of GDP. *Unit*: Percent.

Education Expenditure—Source: World Bank (2003a,b). *Definition*: Expenditure on public education as a share of GDP. *Unit*: Percent.

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