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# International terrorism as a trade impediment?

Peter Egger\* Martin Gassebner†

## Abstract

Earlier work established the notion that international terrorism harms international trade. This evidence was based on annual data with responses in the same year as attacks and incidents and on empirical models which ignored general equilibrium effects. We provide evidence that, if at all, international terrorism displays effects on bilateral and multilateral trade only in the medium run (more than one-and-a-half years after an attack/incident). The findings in this paper suggest that the purely economic short-run impact of international terror on trade is negligible. This does not mean that terror is unimportant. However, its effects should not be looked for in the purely economic domain or in the short run but in economic outcome in the long run and in the disruption of humanitarian and social wellbeing both of which cannot be grasped when looking at economic activity alone.

**JEL classification:** D74; F14; F52; H56; O19

**Keywords:** International terrorism; bilateral trade; gravity model; national security

## 1 Introduction

The attacks of 9/11 entailed a psychological shock on humankind, which had huge consequences not only directly by way of a human tragedy for the almost 3,000 victims and their relatives but also indirectly, e.g., for those who travel internationally by airplane. Thus it would be myopic to measure the impact of those attacks primarily or only in economic terms and, in particular, in short-run responses of economic outcome.

Yet, naturally, with the 9/11 attacks the matter of international terrorism came to the limelight of research, and among that of scholarly work in economics and political science. Related

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research at the interface of these two disciplines primarily focused on a quantification of the causes and consequences of terrorism. Both the roots (see, e.g., Krieger and Meierrieks, 2011) and the consequences of terrorism (see, e.g., Krueger, 2007, pp.105-119) are debated vividly. Among the economic consequences of terrorism discussed in the literature, two stand out: the one on economic growth and the one on international business by way of foreign direct investment, tourism, and international trade (see Frey et al., 2007; Enders and Sandler, 2012 for surveys of those and other effects).

The body of work devoted to the growth effects of terrorism is relatively large but inconclusive. Among the studies pointing to significant negative effects of terrorism the following can be mentioned. Abadie and Gardeazabal (2003) find large effects of terrorism through ETA's campaign for the Basque country, amounting to a reduction of 10% of the Basque country's GDP. This effect is identified on the basis of a synthetic counterfactual analysis. Eckstein and Tsiddon (2004) find large effects of terrorism on output per capita for Israel. Blomberg et al. (2004) find a negative growth effect of terrorism in a cross-country study, using panel data of 177 economies between 1968 and 2000 while Blomberg et al. (2011) show that the negative growth effect is even more pronounced in Sub-Saharan Africa. Gaibullov and Sandler (2008) report negative and significant growth effects in a cross-country study covering Western European economies in the short run.

Among the studies suggesting insignificant effects of terrorism, the following examples can be mentioned. In the cross-country panel-data study of Blomberg et al. (2004), the negative growth effect of terrorism is absent when focusing on developed (OECD) countries. Tavares (2004) does not find significant growth effects of terrorism in a cross-country dataset for the period 1987-2001, once taking a proper set of control variables into account (in his Tables 6 and 7). In their cross-country study on Western Europe, Gaibullov and Sandler (2008) do not find significant effects of terrorism on economic growth in the long run. Similarly, Gaibullov and Sandler (2009), do not find significant effects of terrorism on economic growth among Asian countries.

The literature on the consequences of terrorism for international business primarily, but not only, focuses on international terrorism (which involves at least two countries) as an obstacle to the cross-border economic activity – of investment, tourism, or trade. For instance, Abadie and Gardeazabal (2008) find in a cross section of 110 countries that an increase in terrorist risk at large by one standard deviation results in a drop of the net foreign direct investment position of about 5% of GDP for the average economy. Enders and Sandler (1996) report even larger effects for Spain and Greece but no such effects for France, (Western) Germany, and Italy. Enders et

al. (1992) estimate the cumulative tourism-related losses due to terrorism at \$16bn in continental Europe between 1974 and 1988. However, in 1988 alone the tourism-related revenues were \$74bn so that the aforementioned cumulative number appears relatively small in pure economic terms. Regarding cross-border flows of people, Dreher et al. (2011) find terrorism to act as a “push” factor for skilled migrants leading to a brain drain. Moreover, a number of papers finds significant, and in part sizable, effects of international terrorism on the cross-border trade of goods. The next section is devoted to a more detailed discussion of that work.

Notice that most of the research identifying significant disruptive economic effects of terrorism identifies those from selected countries with repeated events over longer time spans (most notably Israel, the Basque country, or Ireland). Hence, deriving conclusions from those cases for the average terror event may be misleading. For instance, virtually all attempts made to quantify the pure economic effects of the attacks of 9/11 led to small numbers at least in the longer run (e.g., Chernick, 2005; Bloom, 2009). In that regard, Gliberman and Storer (2009) find that there was a reduction of both U.S. exports to and imports from Canada in the aftermath of 9/11. However, the impact of 9/11 on trade is difficult to discern from that of a brief recession in the U.S. between March and November 2001. The causal impact on international goods transactions with the United States after the attacks was virtually zero, and the effect was mostly seen in a short-term reduction of airborne travels to and from the United States as a consequence of the cancelling of flights for several days. Clearly, with the attacks of 9/11 having been by way the most significant events of their kind, we would not expect much smaller individual events – in terms of the number of fatalities or their media echo – to have had bigger purely economic effects.

The aim of this paper is to address two potential shortcomings in earlier work of terrorism on international trade: one relating to measurement error through time aggregation bias (an attribution of changes in economic outcome at an earlier point in time to terrorism events at a later point in time) and a second one relating to general equilibrium effects of terrorism. We address the first issue by using monthly data on international terror events in order to quantify their impact on subsequent international trade within time windows of up to two years. The second issue – existence of general equilibrium effects – is addressed by estimating a structural model of bilateral trade which explicitly accounts for general equilibrium (i.e., direct bilateral trade destruction as well as third-country trade diversion) effects of terrorism on trade. Clearly, in case that terrorism affects GDP – which is a key determinant of bilateral trade – quantifying effects of terrorism on bilateral trade requires respecting general equilibrium effects by way of a

simultaneous impact of terrorism on trade and income.

The findings suggest that economic effects through a disruption of international goods trade are negligible, in particular, in the short run. This finding is not driven by the inclusion or exclusion of countries which received most of the attacks. It turns out that the difference between the small effects identified in this study and the large effects identified in earlier work is indeed due to both time aggregation bias (using annual rather than monthly data) and the neglect of general equilibrium effects in earlier work.

We review the literature on trade effects of terrorism in detail in the next section. Section 3 outlines the theoretical foundation for our analysis, while Section 4 describes the data. Our results are presented in Section 5, and the final section concludes.

## 2 Previous literature

A number of papers address the topic of how terrorism affects international trade. In general, the literature on effects of terrorism on international trade views terrorism as one example of an iceberg-type (i.e., an ad-valorem, variable) trade cost factor. Such costs are supposed to exert a negative effect on the volume of bilateral trade by raising insecurity of trade transactions, by disrupting trust in international business relations, by physically destroying transport infrastructure and even goods themselves, and by rendering cross-border transactions more costly through the increased requirement of security standards.

The first paper in that vein is Nitsch and Schumacher (2004). The authors employ a reduced-form cross-sectional gravity model of bilateral trade – with exports plus imports as the dependent variable – for the years 1968-1979 and incorporate the sum of two trading partners' (log one plus) total terror attacks as a determinant of bilateral trade (alternatively, they use an indicator variable reflecting whether both countries experienced at least one terror attack, or measures of other events of political violence). The authors report that a doubling of a pair's terror attacks reduces its total bilateral trade by 4%.

Blomberg and Hess (2006) estimate two variants of a gravity model to assess effects of terrorism on bilateral trade – with exports plus imports divided by two as the dependent variable – using annual panel data for the period of 1968-1999. Terrorism is measured by a binary indicator variable taking the value of one if at least one terrorist event was recorded for either country in a trading pair and year. The authors report that bilateral trade falls by 5-6% if a pair experiences at least one terror incident. Terror is estimated to have a tariff equivalent of 0.65% to 1.46% under

reasonable assumptions.

Mirza and Verdier (2008) formulate a structural model of bilateral trade with terrorism as one of its (trade-cost-like) determinants. They point to four main issues affecting previous work (see Mirza and Verdier, 2008, p.181): omitted variables bias; persistence of terror and its indirect effect on trade via GDP (a general equilibrium effect as mentioned above); ignorance of a difference between location, target, and perpetrator effects; and a potential bias accruing to reverse causation between terror and trade through the use of terrorism security measures. However, earlier work demonstrated that trade is not a robust determinant of terrorism so that reverse causation of international terrorism and trade seems of minor importance (see Gassebner and Luechinger, 2011).

De Sousa et al. (2009) use bilateral U.S. panel data at the 4-digit SITC level from 1993-2002 and analyze the effect of terror against the United States on U.S. imports, focusing on the effect of terror attacks in countries in close proximity to the exporting partner. They find that both terror attacks in the exporting partner and in neighbours of the exporter reduce U.S. imports.<sup>1</sup> Each attack is estimated to reduce trade by about 1% when happening in the exporting country and by about 0.5% when happening in the exporter's neighbouring countries.

De Sousa et al. (2010) employ a structural gravity model to assess how terror attacks against the United States in the exporter's neighbours may affect U.S. imports over the time span 1993-2006. Relative to De Sousa et al. (2009), they employ a broader concept of (geographical and cultural) neighbourhood to assess cross-border spillover effects of terrorism on international trade. They assess how terror attacks in an exporter's neighbour affect U.S. bilateral imports from that exporter, as in De Sousa et al. (2009). They confirm a direct effect of terrorism on bilateral trade, and they find that indirect negative effects of terror from third countries affect U.S. bilateral imports more if the third country is more similar to the exporter.

We may summarize earlier work as follows. First, it utilized annual panel data or cross-sectional data of trade and (contemporaneous) bilateral terrorism to identify the impact of the latter on the former. Second, most of it ignored general equilibrium effects of terrorism on trade. Finally, it mostly employed data on terrorism prior to 9/11. The goal of the subsequent analysis is to avoid time aggregation bias and gain a better understanding of the dynamic adjustment of trade to international terrorism by using monthly data on bilateral trade and events data on terrorism, utilizing a large bilateral panel data-set which covers the time span 1970-2008. This analysis will

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<sup>1</sup>Since this study focuses on the USA as an importer, effects of terror attacks on U.S. soil are included in the year fixed effect.

respect general equilibrium effects so that direct and indirect (third-country and price as well as income) effects can be discerned.

### 3 A structural model of bilateral trade

We utilize a linearized structural general equilibrium model of international trade to assess the effects of terrorism on monthly directed trade. Such a model has three virtues. First, such a model allows assessing not only direct trade destruction effects of terrorism on trade for countries and country-pairs that are exposed to terrorist attacks. On the contrary, the model accounts for price (and income) reactions by respecting income constraints (i.e., that total expenditures must equal total income), consistent with general equilibrium. As a consequence, bilateral changes in trade costs – of which terrorist attacks are a part (as in the literature summarized in Section 2) – induce not only bilateral but also multilateral effects. In a nutshell, an increase in bilateral trade costs (e.g., by way of additional terrorist attacks) induces direct negative trade destruction effects which are cushioned by accompanying, unilateral, negative price and income effects which affect terror-exposed countries' trade with third countries. Second, it allows avoiding a time aggregation bias of international terror effects on bilateral trade, since terror events later in the year may not have an impact on trade flows earlier in the same year (the later is arguably a major source of endogeneity). In particular, time aggregation bias appears relevant to the extent that some of the trade-cost-related aspects of terrorism – especially those related to additional security measures – should be relevant only with delay to an attack. Finally, related to the previous point, the proposed approach permits evidence on the timing of short-to-medium-term trade responses to terror attacks.

In broad terms, we follow Baier and Bergstrand (2009) with regard to the model structure. These authors provide a linearization to the estimating equation for bilateral exports or imports as outlined in Anderson and van Wincoop (2003), a structural gravity model of bilateral trade that is consistent with multi-country general equilibrium. For convenience, and in line with earlier research, let us denote exporting countries by  $i = 1, \dots, J$ , importing countries by  $j = 1, \dots, J$ , time (months) by  $t = 1, \dots, T$ . In our data with individual OECD country exports,  $J = 181$  and  $T = 468$ .<sup>2</sup> Let us use  $X_{ijt}$  to denote aggregate nominal exports of country  $i$  to country  $j$  at time  $t$ ,  $Y_{it}$  to denote GDP of country  $i$  at time  $t$ , and  $\theta_{it}$  to denote country  $i$ 's GDP as a share of world

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<sup>2</sup>In case of individual OECD country imports,  $i = 1, \dots, 181$ .

GDP at time  $t$ . Then, the general bilateral export equation can be written as

$$\ln \frac{X_{ijt}}{Y_{it}Y_{jt}} = \alpha_t + \ln \tilde{\tau}_{ijt}^{1-\sigma} + u_{ijt} \quad (1)$$

$$\ln \tilde{\tau}_{ijt}^{1-\sigma} = \ln \tau_{ijt}^{1-\sigma} - \left( \sum_{i=1}^J \theta_{it} \ln \tau_{ijt}^{1-\sigma} \right) - \left( \sum_{j=1}^J \theta_{jt} \ln \tau_{ijt}^{1-\sigma} \right) + \left( \sum_{j=1}^J \theta_{it} \theta_{jt} \ln \tau_{ijt}^{1-\sigma} \right) \quad (2)$$

where  $\tau_{ijt}^{1-\sigma}$  is a function of observable trade costs  $h_{kijt}$  with  $k = 1, \dots, K$ , where one element  $h_{kijt}$  captures international terrorism at time  $t$  or some period earlier than that as a trade (or transaction) cost,  $\alpha_t$  is a time-specific constant which captures monthly and seasonal effects, and  $u_{ijt}$  is a stochastic disturbance term. The elements in  $\tau_{ijt}$  are measures of iceberg trade costs (Samuelson, 1952).

A reduced-form gravity model which disregards general equilibrium would replace  $\ln \tilde{\tau}_{ijt}^{1-\sigma}$  by  $\ln \tau_{ijt}^{1-\sigma}$  in equation (1). Notice that the difference between  $\ln \tilde{\tau}_{ijt}^{1-\sigma}$  and  $\ln \tau_{ijt}^{1-\sigma}$  in the structural model roots in the acknowledgement of the income constraint by way of which  $Y_{it} = \sum_{j=1}^J X_{ijt}$  for all exporting countries and time periods,  $it$ .

In line with previous research, international terrorism is argued to represent such an iceberg-type cost to the extent that it destroys bilateral trade that would otherwise have taken place. The latter occurs through the destruction of production facilities and goods themselves as two relatively minor obstacles and the destruction of business contacts through increased transportation and travel costs and a deterioration of trust.

In general, we assume  $\tau_{ijt}^{1-\sigma} = \prod_{k=1}^K \tau_{kijt}^{1-\sigma}$  with  $\tau_{kijt}^{1-\sigma} = h_{kijt}^{\beta_k}$  so that we may write

$$\ln \frac{X_{ijt}}{Y_{it}Y_{jt}} = \alpha_t + \left( \sum_{k=1}^K \beta_k \ln \tilde{h}_{kijt} \right) + u_{ijt} \quad (3)$$

$$\ln \tilde{h}_{kijt} = \ln h_{kijt} - \left( \sum_{i=1}^J \theta_{it} \ln h_{kijt} \right) - \left( \sum_{j=1}^J \theta_{jt} \ln h_{kijt} \right) + \left( \sum_{j=1}^J \theta_{it} \theta_{jt} \ln h_{kijt} \right) \quad (4)$$

Hence, all that is needed for estimation are measures of  $\ln \frac{X_{ijt}}{Y_{it}Y_{jt}}$ , of  $\theta_{it}$ , and of  $\ln h_{kijt}$ . While  $\beta_k$  is the parameter on (or partial effect of)  $h_{kijt}$ , the total effect (or marginal effect, or elasticity) is approximated by

$$\frac{\partial \beta_k \ln \tilde{h}_{kijt}}{\partial \ln h_{kijt}} = \beta_k (1 - \theta_{it} - \theta_{jt} + \theta_{it} \theta_{jt}) \quad (5)$$

While the marginal effect of trade cost measure  $h_{kijt}$  on bilateral exports or imports accounts for general equilibrium effects, where  $-\beta_k \theta_{it}$  dampens the direct effect of  $h_{kijt}$  and represents a



unilateral effect of it on all exports of country  $i$  at time  $t$ . Obviously, to the extent that higher trade costs through  $h_{kijt}$  affect export prices of country  $i$  at time  $t$  in general, the effect of  $h_{kijt}$  on the costs of trade of country  $i$  with country  $j$  at time  $t$  will be relatively smaller. Similarly,  $-\beta_k\theta_{jt}$  dampens the direct effect of  $h_{kijt}$  and represents a unilateral effect of it on all imports of country  $j$  at time  $t$ . Again, to the extent that higher trade costs through  $h_{kijt}$  affect import prices of country  $j$  at time  $t$  in general, the effect of  $h_{kijt}$  on the costs of trade of country  $j$  with country  $i$  at time  $t$  will be relatively smaller.  $\beta_k\theta_{it}\theta_{jt}$  is a (small) correction factor. The marginal effect in (5) respects GDP accounting and general equilibrium through a multilateral balance of payments, taking into account trade destruction (as the opposite of trade creation) and trade diversion (in the sense of third-country and income effects) through the budget constraint of consumers (see Anderson, 1979; Anderson and van Wincoop, 2003).

Readers who are familiar with panel data econometrics will recognize the similarity between the transformation of trade costs  $\ln \tilde{h}_{kijt}$  in equation (3) and the so-called within transformation in fixed effects models with two types of fixed effects (see Baltagi, 2008, ch. 3). A within estimator with exporter-time and importer-time fixed effects would transform all trade costs  $\ln h_{kijt}$  into  $\ln \check{h}_{kijt} = \ln h_{kijt} - \left(\frac{1}{J} \sum_{i=1}^J \ln h_{kijt}\right) - \left(\frac{1}{J} \sum_{j=1}^J \ln h_{kijt}\right) + \left(\frac{1}{J^2} \sum_{j=1}^J \ln h_{kijt}\right)$  (and would do the same with the dependent variable). With symmetric (identical) countries, the latter would be identical to the transformation in (4). Accordingly, (3) represents a quasi two-way within transformation of the right-hand side of the model with exporter-time and importer-time fixed effects so that a correlation of  $\ln \tilde{h}_{kijt}$  with omitted exporter-time-specific or importer-time-specific variables is virtually impossible. Hence, the model in (3) can be estimated by pooling the data across periods and including time-specific but not exporter-time-specific or importer-time-specific fixed effects.

In any case, with international terror events or fatalities in  $t$  or prior to  $t$  representing some of the elements  $\ln h_{kijt}$ , the corresponding parameters  $\beta_k$  should be interpreted as partial but not as marginal (or total) effects of international terror on bilateral trade.<sup>3</sup> It is the goal of the subsequent empirical analysis to measure the direct and total effects of trade with respect to terrorism relative to those of other trade costs.

By including contemporaneous as well as lagged terror measures in  $\ln \tilde{h}_{kijt}$  and by measuring  $t$  in months, this analysis is capable of avoiding time aggregation bias, of accounting for sluggish responses of trade to terror, and of respecting general equilibrium (income and third-country)

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<sup>3</sup>We use multilateral international terrorism variables for the exporter and importer by month in the empirical analysis. Using the present notation, such measures would be denoted as  $\ln h_{kit}$  and  $\ln h_{kjt}$ , here.

effects altogether.

## 4 Data

We use data provided by the OECD on monthly, directed, aggregate import and, alternatively, export flows (in US\$) between 30 individual OECD member countries and 181 partner countries for all 468 months between January 1970 and December 2008.<sup>4</sup> The total number of trading pairs for which positive trade may be (but is not necessarily) observed per time period is 5,400. Due to the formation of countries after the Cold War, the number of pairs is 5,400 only from 1990 onwards but 3,146 before that.<sup>5</sup> Hence, due to the availability of trade data, 59 countries enter the estimation sample in 1990.

In order to approximate trade costs akin to the existing literature we rely mainly on data provided by the Centre d'Études Prospectives et d'Informations Internationales (CEPII).<sup>6</sup> We use bilateral variables on colonial heritage and distance. In particular, we employ binary indicator variables for a common border, a common language spoken by at least 9% of both countries' population, pairs which have been in a colonial relationship, pairs currently being in a colonial relationship, "economies" being identical national entities, and, as a continuous bilateral trade cost measure, the great circle (log) distance between the most populated cities of two countries. For instance, see Glick and Rose (2002) for the use of those trade cost proxies in gravity models. Moreover, we construct binary variables indicating whether one trading partner or both are landlocked (taken from Easterly and Sewadeh, 2001), World Trade Organization (WTO) members (retrieved from the WTO web page), and whether they are members of the same regional trade agreement (the data have been constructed on the basis of information from the WTO; see Egger and Wamser, 2013), respectively.

While trade data are available on a monthly basis, GDP is not. To construct the share of country  $i$  in world GDP in month  $t$  ( $\theta_{it}$ ), monthly GDP data are required. We approximate monthly GDP by using annual GDP together with the monthly share of a country's aggregate annual imports to impute  $\theta_{it}$ . Hence, for every country and year, the annual level of GDP is as observed, but its monthly pattern is interpolated. Notice that bilateral and unilateral (total)

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<sup>4</sup>The data is available at [http://www.oecd.org/document/12/0,3746,en\\_2649\\_34241\\_1947340\\_1\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/12/0,3746,en_2649_34241_1947340_1_1_1_1_1,00.html) (last accessed February 18, 2012). We refrain from averaging over or summing exports and imports, which is dubbed the "silver medal mistake" in Baldwin and Taglioni (2006).

<sup>5</sup>We provide summary statistics of the variables employed in the empirical analysis in Table 4 and details on the country coverage in Table 5 in the Appendix.

<sup>6</sup>Available at <http://www.cepii.fr/anglaisgraph/bdd/distances.htm> (last accessed on February 18, 2012).

imports of a country are proportional to its GDP at any point in time, according to the theoretical model employed in this paper, whereby not only  $Y_{it} = \sum_{j=1}^J X_{ijt}$  (as used in Section 3) but also  $Y_{jt} = \sum_{i=1}^J X_{ijt}$ . Therefore, unilateral imports may be used to “allocate” annual GDP across the months in a year.

To measure terrorist activity we use information from the “International Terrorism: Attributes of Terrorist Events” (ITERATE) database, provided by Mickolus et al. (2009). ITERATE provides data on global terrorist acts, including information on the type of attack, casualties and fatalities, and information about perpetrators and victims. The data are available for the period 1968-2008 with exact dates. According to Mickolus et al. (2004: 2) “*International/transnational terrorism is the use or threat of use, of anxiety-inducing extra-normal violence for political purposes by any individual or group, whether acting for or in opposition to established government authority, when such action is intended to influence the attitudes and behavior of a target group wider than the immediate victims and when, through its location the mechanics of its resolution, its ramifications transcend national boundaries.*” ITERATE exclusively focuses on transnational terrorism, i.e., the location of the attack, the target of an attack or the perpetrator are not of identical nationalities. Given that our focus is on the effect of terrorism on international trade this is exactly the type of terrorism which we should focus on.<sup>7</sup>

Specifically, we add the total number of terror attacks taking place in a given month and country. We do so for each of the trading partners separately which allows us to distinguish between effects of terrorism on exporting versus importing. Besides the monthly number of terror attacks, we also obtain the number of persons killed in these attacks (fatalities) and use them as an alternative measure for terror activity. While especially in the recent past international terrorism seems to be an always present phenomena, attacks are an infrequent event, at least on a worldwide scale. In approximately 90% of the months in our sample no transnational terror attack has occurred. Nonetheless it is a widespread phenomenon as only 16% of our countries – mostly small island states – did not suffer from a terror attack on their soil.

In order to gauge the long-run implications of terrorism as opposed to its short-to-medium-term effects, we also construct stock variables of the number of attacks and fatalities by summing incidents from the start of our sample up to the month in question. We do so by using the terror source data in order to account for all attacks having taken place in a country, irrespective of whether the country was in the estimation sample at that time period or not.

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<sup>7</sup>In a sensitivity analysis, we illustrate that taking a broader view of terrorism by accounting for both domestic and transnational terrorism does not alter the findings in qualitative terms.

We provide the summary statistics for all variables employed in the empirical analysis in Table 4 of the Appendix.

## 5 Empirical results

This section is organized in four parts. In the first one, we summarize parameter estimates for various specifications and estimators, while testing the robustness of our results in part two. We discuss the effects of terrorism on trade, taking into account general equilibrium repercussions and indirect economic effects in part three and dwell on the implications of our results in part four.

### 5.1 Parameter estimates

Table 1 summarizes coefficients which are estimated from a Poisson pseudo-maximum likelihood specification for a gravity model akin to an exponentiated version of equation (3). The standard errors of that model are robust to clustering at the country-pair level to account for the presence of equicorrelation through repeated observation of the same country-pair across the months in the sample.<sup>8</sup>

Table 1 contains parameters and some further information for eight estimated models, labelled (1)-(8). Models (1)-(4) refer to data on imports by OECD countries from OECD and other countries, while Models (5)-(8) refer to data on exports of OECD countries to OECD and other countries. Hence, variables indicating terror events or fatalities for an importer always refer to an OECD country in Models (1)-(4), while variables indicating terror events or fatalities for an exporter always refer to an OECD country in Models (5)-(8). Models with odd numbers include contemporaneous terror events or fatalities only, while models with even numbers include once-lagged stocks along with contemporaneous flows of terror events or fatalities. Hence, models with even numbers allow for insights in long-run effects (assuming an infinite memory within the sample period) of terror on trade while ones with odd numbers focus on short-term (within-the-same-month) effects. The corresponding results can be summarized as follows.

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<sup>8</sup>In Table 6 of the Appendix, we report coefficients and standard errors for a zero-inflated Poisson model. Notice that the dependent variable is zero for more than 34% of the observations. The latter would lead to an unjustifiable loss of 34% of the observations with a log-transformed OLS model as in equation (3). The Poisson and zero-inflated Poisson estimators utilize the observations on zero bilateral trade flows in estimation. It turns out that putting extra weight on the numerous zeros in the data with zero-inflated Poisson estimation does not lead to drastically different results from the Poisson models which give equal weights to the zeros as to other levels of trade flows. Log-transformed OLS models (which are suppressed for the sake of brevity) lead to a sizable bias with the data at hand (see Santos Silva and Tenreyro, 2006, and Egger et al., 2011, for the general problems with OLS in such contexts). Notice that earlier research relied exclusively on such problematic OLS estimates. Due to the qualitative similarity of the Poisson and zero-inflated Poisson models, we focus on the discussion of the former and leave an inspection of the zero-inflated Poisson model estimates in Table 6 to the interested reader.

By and large, the results suggest that the general-equilibrium-consistent parameters of stocks of lagged terror fatalities in both the exporter and the importer tend to reduce bilateral exports in a given average period, except for the model in column (4). The corresponding short-run effects of contemporaneous new fatalities in columns (3)-(4) and (7)-(8) are never statistically significant. Contemporaneous terror events (rather than fatalities) exert no effects at all – in columns (2), (5), and (6) – or significant effects which are difficult to interpret, being negative for the exporter but positive for the importer. With exception of contemporaneous events effects in column (1), the direct effects as captured by the coefficients tend to be small. The positive coefficient for the importing country is consistent with a rebuilding effort directly after a terror attack. Such a behaviour is in line with a country’s behaviour in the aftermath of a natural disaster (see Gassebner et al., 2010).

However, one potential problem with the results in Table 1 is time aggregation bias. Implicitly, we assumed that the process about effects of terror on trade had an infinite memory (in even-numbered columns) or was extremely myopic with a memory of just one month (in odd-numbered columns). Either strategy may have led to a bias of the direct effect of terror on trade as captured by the respective parameters. An intermediate strategy would be to look at dynamic adjustment to the ultimate impact of terror.

We consider the latter in Tables 2 which are counterparts to the even-numbered models in Table 1. These tables discern the contributions of terror events and fatalities during the first twelve months of their occurrence on bilateral trade. Let us again focus on the Poisson results in Table 2 and leave a comparison to the zero-inflated Poisson model approaches in Table 7 to the interested reader.

Interestingly, Table 2 suggests rather different conclusions from Table 1. In fact, there is little evidence of any impact – events or fatalities – of terror on bilateral exports or imports during the first year of their occurrence. Hence, the effects in Table 1 are likely driven by time aggregation bias. The latter may partly be associated with the correlation of once-lagged terror stock variables with confounding omitted variables. We would argue that adjustments to terror should materialize at least in part within a year after a fatality or event had occurred. There is no evidence of that. Accordingly, we would conclude that terror does not cause purely economic effects through an impact on bilateral trade. This of course does not mean that terrorism is not important. It is well documented the terror has large effects in the political (e.g., Siqueira and Sandler, 2007; Gassebner et al., 2011) or societal (e.g., Silver et al., 2002; Frey et al., 2009) arena but its mere impact on

Table 1: Trade of OECD countries with the world, Poisson, 1970-2008

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OECD imports from the world				OECD exports to the world			
Common border	0.998 (4.48)***	1.044 (4.67)***	0.999 (4.48)***	1.041 (4.48)***	0.519 (2.44)**	0.645 (3.06)***	0.519 (2.44)**	0.622 (2.88)***
Common language	-0.232 (0.80)	-0.262 (0.89)	-0.231 (0.80)	-0.255 (0.87)	0.409 (0.81)	0.424 (0.81)	0.409 (0.81)	0.394 (0.78)
Colonial ties (ever)	0.238 (0.97)	0.222 (0.87)	0.236 (0.97)	0.221 (0.86)	0.110 (0.43)	0.017 (0.06)	0.110 (0.43)	0.018 (0.07)
Current colonial relationship	0.652 (0.32)	0.742 (0.37)	0.648 (0.32)	0.602 (0.30)	0.749 (0.90)	0.900 (1.14)	0.748 (0.90)	0.668 (0.83)
Colonial ties (post 1945)	1.391 (4.82)***	1.357 (4.59)***	1.395 (4.81)***	1.452 (4.38)***	1.131 (2.87)***	1.167 (3.12)***	1.132 (2.87)***	1.310 (3.33)***
Same country	0.959 (3.29)***	0.889 (3.03)***	0.959 (3.29)***	0.911 (3.13)***	0.059 (0.15)	-0.007 (0.02)	0.059 (0.15)	0.043 (0.11)
Distance (log)	-0.360 (2.84)***	-0.379 (3.07)***	-0.360 (2.84)***	-0.364 (2.90)***	-0.784 (4.44)***	-0.781 (4.46)***	-0.784 (4.44)***	-0.760 (4.33)***
Regional trade agreement	0.340 (2.04)**	0.370 (2.21)**	0.339 (2.03)**	0.302 (1.80)*	0.582 (2.59)***	0.599 (2.67)***	0.581 (2.59)***	0.527 (2.32)**
One WTO member	6.230 (5.06)***	5.938 (4.25)***	6.264 (5.08)***	7.059 (5.04)***	13.040 (6.91)***	14.414 (5.96)***	13.046 (6.91)***	14.545 (6.90)***
Two WTO members	-1.615 (1.06)	-1.781 (1.00)	-1.551 (1.03)	-0.173 (0.13)	1.415 (0.69)	4.976 (2.06)**	1.425 (0.70)	4.464 (2.37)**
One landlocked country	-37.603 (2.70)***	-36.656 (2.60)***	-37.637 (2.70)***	-37.987 (2.68)***	-47.193 (4.06)***	-44.688 (3.94)***	-47.200 (4.06)***	-47.804 (4.07)***
Two landlocked countries	-74.951 (2.70)***	-73.112 (2.60)***	-75.019 (2.70)***	-75.744 (2.68)***	-94.301 (4.07)***	-89.355 (3.94)***	-94.316 (4.07)***	-95.547 (4.07)***
Terror events (exporter)	-1.929 (2.29)**	-1.120 (1.23)			0.817 (0.91)	-0.099 (0.10)		
Terror events (importer)	2.034 (2.36)**	1.233 (1.32)			-0.807 (0.91)	0.110 (0.11)		
Terror events stock (exporter), t-1		-0.008 (5.06)***				0.005 (1.07)		
Terror events stock (importer), t-1		0.010 (3.29)***				-0.011 (4.31)***		
Terror fatalities (exporter)			0.027 (0.69)	0.041 (1.04)			0.008 (0.21)	-0.002 (0.05)
Terror fatalities (importer)			-0.023 (0.62)	-0.037 (1.01)			-0.012 (0.31)	-0.003 (0.08)
Terror fatalities stock (exporter), t-1				-0.009 (4.65)***				-0.022 (2.48)**
Terror fatalities stock (importer), t-1				3.9E-04 (0.06)				-0.010 (3.24)***

Notes: The table presents the results of Poisson estimations using monthly data from 1970-2008. The sample contains 5,400 trading pairs, totaling 1,986,094 (odd columns) and 1,980,694 (even columns) observations, respectively. Columns (1)-(4) report OECD countries importing goods from the world (including other OECD countries) while columns (5)-(8) show OECD exports to the world. Constant term and time dummies are included but suppressed in the table. Standard errors are clustered at the trading pair level; t-statistics are reported in parentheses below the coefficient. \*/\*\*/\*\* indicates significance at the 10/5/1-% level.

trade (and probably GDP) is small on average.

The latter conclusion is rather different from earlier work on terror effects on trade so that some discussion is warranted. First of all, it should be mentioned that the obtained results are not due to the inappropriate aggregation of countries which are strongly versus only mildly exposed to terror. There is no indication whatsoever that a strong exposition to terror leads to a stronger reduction in trade. For instance, we have run the same regressions as for Models (1)-(8) in Table 1 but distinguishing the coefficients between the top-10 recipient countries w.r.t. terror events and fatalities versus all other countries as well as for the 10 countries which exhibit the largest variance over the period 1968-2008.<sup>9</sup> Those results are suppressed for the sake of brevity but available from the authors upon request.

Second, earlier work had not pursued a strategy of using monthly data, but it relied on cross-sectional or annual panel data with a much less precise association of terror dates with trade statistics as is possible with monthly statistics. Hence, there is a chance of time aggregation bias which we were able to avoid or, at least reduce, by using monthly data.

Third, earlier work did not control for third-country effects associated with general equilibrium. Anderson and van Wincoop (2003) showed that an ignorance of such effects tends to lead to exaggerated effects of trade costs, and we can think of terror to be an example of trade costs in broad terms. Hence, controlling for problems associated with the log of gravity (Santos Silva and Tenreyro, 2006), with general equilibrium effects (see Anderson and van Wincoop, 2003), and with time aggregation bias, economic effects of terror on trade are negligible, according to our findings relative to those in the literature.

## 5.2 Robustness

Apart from the regressions in Tables 1-2 and 6-7, we assessed the robustness of our findings along three lines: the lag structure (timing) of effects of international terror incidents and fatalities, respectively; the use of a broader concept of terror incidents and fatalities (domestic plus international terror instead of international terror events only); and the use of gravity models without multilateral resistance terms to see whether the data, the econometric approach, or the multilateral modelling of terror (and other trade cost) effects is responsible for the difference between our

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<sup>9</sup>Let us use “10” to indicate top-10 recipients, “var” to indicate countries among the ones with the 10 highest variances, “-a” attacks, and “-f” fatalities. Then, these countries are: Afghanistan (10-f), Angola (10-f, var-f), Argentina (10-a, var-a), Canada (var-f), Colombia (10-a, 10-f), France (10-a, var-a), Germany (10-a, var-a), Greece (10-a), India (10-f, var-a), Indonesia (var-f), Iraq (10-f, var-a, var-f), Israel (10-f), Italy (10-a), Kenia (var-f), Lebanon (10-a, 10-f, var-a, var-f), Malaysia (var-a), Netherlands (var-a), Pakistan (10-f), Russia (10-f, var-f), Spain (var-f), Turkey (10-a), U.K. (10-a, 10-f, var-a, var-f), USA (10-a, var-a, var-f).

Table 2: Trade of OECD countries with the world: Terror dynamics, Poisson, 1970-2008

	(1)	(2)	(3)	(4)
	OECD imports		OECD exports	
	Events	Fatalities	Events	Fatalities
Terror (exporter)	0.223 (0.38)	0.026 (0.66)	0.145 (0.31)	0.008 (0.23)
Terror (exporter), t-1	-1.188 (3.27)***	0.008 (0.28)	0.418 (1.11)	0.032 (0.83)
Terror (exporter), t-2	0.127 (0.43)	-0.014 (0.42)	0.095 (0.32)	0.046 (1.19)
Terror (exporter), t-3	-0.676 (0.81)	-0.015 (0.43)	0.611 (1.61)	0.053 (1.34)
Terror (exporter), t-4	0.119 (0.33)	-0.006 (0.17)	-0.307 (0.80)	0.014 (0.37)
Terror (exporter), t-5	-0.258 (0.99)	0.022 (0.70)	0.210 (0.56)	0.004 (0.09)
Terror (exporter), t-6	-0.195 (0.46)	0.005 (0.15)	-0.182 (0.40)	0.034 (0.97)
Terror (exporter), t-7	0.349 (0.73)	0.010 (0.26)	-0.073 (0.13)	-0.081 (1.65)*
Terror (exporter), t-8	-0.771 (1.62)	-0.026 (0.80)	0.016 (0.04)	0.039 (0.95)
Terror (exporter), t-9	-1.061 (1.45)	-0.030 (0.89)	0.244 (0.67)	0.016 (0.46)
Terror (exporter), t-10	-1.346 (1.69)*	-0.001 (0.03)	0.599 (1.27)	0.035 (1.02)
Terror (exporter), t-11	-1.552 (1.88)*	0.012 (0.32)	0.753 (1.42)	0.067 (1.76)*
Terror (exporter), t-12	-1.543 (1.30)	0.044 (1.00)	0.519 (1.20)	0.038 (1.03)
Terror (importer)	-0.177 (0.30)	-0.020 (0.57)	-0.160 (0.34)	-0.012 (0.32)
Terror (importer), t-1	1.287 (3.26)***	0.005 (0.20)	-0.383 (0.97)	-0.038 (0.91)
Terror (importer), t-2	-0.078 (0.28)	0.021 (0.64)	-0.139 (0.46)	-0.052 (1.24)
Terror (importer), t-3	0.673 (0.79)	0.015 (0.43)	-0.610 (1.58)	-0.059 (1.41)
Terror (importer), t-4	-0.062 (0.18)	0.005 (0.16)	0.282 (0.73)	-0.017 (0.43)
Terror (importer), t-5	0.358 (1.29)	-0.020 (0.69)	-0.158 (0.41)	-0.006 (0.13)
Terror (importer), t-6	0.217 (0.52)	-0.004 (0.12)	0.159 (0.35)	-0.040 (1.03)
Terror (importer), t-7	-0.361 (0.75)	-0.010 (0.26)	0.120 (0.21)	0.079 (1.69)*
Terror (importer), t-8	0.860 (1.72)*	0.027 (0.89)	0.058 (0.12)	-0.044 (0.97)
Terror (importer), t-9	1.111 (1.52)	0.026 (0.81)	-0.242 (0.64)	-0.020 (0.53)
Terror (importer), t-10	1.433 (1.71)*	0.001 (0.02)	-0.565 (1.25)	-0.041 (1.13)
Terror (importer), t-11	1.631 (2.01)**	-0.017 (0.44)	-0.746 (1.42)	-0.083 (1.90)*
Terror (importer), t-12	1.664 (1.35)	-0.043 (0.99)	-0.578 (1.32)	-0.052 (1.25)

Notes: See notes to Table 1. The sample contains 5,400 trading pairs, totaling 1,921,294 observations. \*/\*\*/\*\* indicates significance at the 10/5/1-% level.



(small) effects and the (large) ones in the literature.

With regard to the timing of effects, it turns out that the results are qualitatively robust when considering up to 24 months rather than only 12 months. Tables 8 and 9 provide counterparts to Tables 2 and 7, being based on Poisson and zero-inflated Poisson regressions, respectively. However, it should be mentioned that a few time lags appear significant when considering longer windows, pointing to some inertia in the materialization of terror effects on trade. However, the accumulated direct trade response to international terror is negative and significant only for the exporting partners of OECD countries in Table 8 (at the 5 percent level).

Considering not only international but also domestic terror when looking at the effects of trade requires a different data source.<sup>10</sup> In particular, such information is available from the global terrorism database (GTD) which again permits distinguishing between terror incidents and fatalities.<sup>11</sup> While the average number of international terror events in the data as used in Tables 1 and 2 amounts to 0.34 and 0.15 incidents and 0.18 and 0.18 fatalities per month for the average OECD/partner country, these numbers are 1.49 and 1.14 and 1.19 and 2.72, respectively, when considering both domestic and international terror. Only 13 countries in the world have not experienced at least one terror attack in the sample period according to this definition. Turkmenistan is the largest among these countries.<sup>12</sup> However, it turns out that considering the broader definition of terror leads to very similar terror elasticities of trade to the ones in Tables 1 and 2. Hence, no matter of whether we apply a more narrow or a broader terror concept, the pure trade-induced economic effects of terror are small.<sup>13</sup>

### 5.3 Total effects of terrorism on trade

Remember that the coefficients reported in the regression tables only reflect direct effects of trade costs. The total effect of trade cost  $h_{kijt}$  on bilateral trade is given by  $\frac{\partial \beta_k \ln \tilde{h}_{kijt}}{\partial \ln h_{kijt}} = \beta_k (1 - \theta_{it} - \theta_{jt} + \theta_{it}\theta_{jt})$ . As it turns out, the average  $\theta_{it}$  for an OECD country is roughly 0.03 while for all countries it is 0.006. Thus for the average country-pair one has to multiply the coefficients in the table by about  $(1 - 0.03 - 0.006 + 0.03 \cdot 0.006) \approx 0.96$ . For specific countries and country-pairs this is can be very different, of course. For the United States (our “largest country”)

<sup>10</sup>In domestic terror events all actors have the nationality of the state where the attacks take place. In the literature domestic terrorism is shown to have different dynamics and determinants as compared to international terrorism (e.g., Savun and Phillips, 2009; Enders et al., 2011).

<sup>11</sup>Available at <http://www.start.umd.edu/gtd/>.

<sup>12</sup>The other countries without an attack in our sample period are: Cap Verde, Micronesia, Greenland, Kiribati, St. Lucia, Marshall Islands, Oman, Palau, Tonga, Tuvalu, and St. Vincent and the Grenadines.

<sup>13</sup>Results available upon request.

and its “average” partner, the corresponding weighting factor is 0.7. However, this shows that the coefficients approximate total elasticities quite well except for the largest economies in the sample. Notice that other authors had controlled for general equilibrium effects by including fixed country effects with cross-section data and fixed country-time effects with panel data (see, e.g., Blomberg and Hess, 2006). However, such a procedure only permits consistent estimation of the direct effect of terrorism on trade (captured by  $\beta_k$ ) but not calculation of general equilibrium comparative static effects.

## 5.4 Discussion

It appears worthwhile to investigate which one of three differences (considering general equilibrium effects, differentiating between effects on exporters and importers, or using monthly data) is key for the starkly different results in this paper from the ones identified in previous research. To shed light on this matter, we replicate the set-up from Blomberg and Hess (2006) with our data. In Table 3, we employ an OLS estimator and refrain from transforming our variables to account for general equilibrium effects of terror and other trade costs and use a binary variable which is unity if a terror attack happens in at least one of the two trading partners and zero else. The coefficients from the associated regressions are directly comparable to the ones in Blomberg and Hess (2006) – though being based on a different source, sample, and – most importantly – frequency of the data. It turns out that this alternative model leads to a very similar direct trade elasticity of international terror to the one in Blomberg and Hess (2006). In fact for OECD imports we find basically an identical coefficient as in Blomberg and Hess (2006: 605): -0.052 as compared to -0.051 (see column 3 of their Table 1). For OECD exports the coefficient of interest is half as large as the one in Blomberg and Hess but the 95%-confidence intervals overlap: -0.021 (standard error 0.006) as compared to -0.051 (standard error 0.014).<sup>14</sup>

What are reasons for why the effect of terrorism on trade is actually small? One is that terrorism comes at a cost and most countries undertake measures to prevent it (e.g., by way of security controls at ports of entry into countries). For instance, Customs-Trade Partnership Against Terrorism (C-TPAT), a government-private sector partnership which was founded in November 2011 as a result of 9/11, is one of such measures taken by the United States. To quote the institution itself, “*C-TPAT seeks to safeguard the world’s vibrant trade industry from terrorists, maintaining*

<sup>14</sup>Recall that Blomberg and Hess (2006) used annual panel data for 177 countries and the period 1968-1999. However, this does not appear to matter for the results. What is important is the consideration of third-country effects (see Anderson and van Wincoop, 2003, for similar insights in the context of U.S. border effects).

Table 3: Replication of Blomberg and Hess (2006, Table 1, column 3)

	(1)	(2)
	log(imports)	log(exports)
GDP (log) (OECD country)	0.619 (12.20) <sup>***</sup>	0.561 (15.60) <sup>***</sup>
GDP (log) (partner country)	0.726 (17.54) <sup>***</sup>	0.761 (27.55) <sup>***</sup>
Population (log) (OECD country)	1.841 (6.44) <sup>***</sup>	1.075 (4.84) <sup>***</sup>
Population (log) (partner country)	-1.443 (14.05) <sup>***</sup>	-0.300 (3.94) <sup>***</sup>
Common border	-0.047 (0.31)	-0.188 (1.19)
Common language	0.413 (5.65) <sup>***</sup>	0.481 (8.11) <sup>***</sup>
Colonial ties (ever)	0.574 (4.44) <sup>***</sup>	0.604 (5.38) <sup>***</sup>
Current colonial relationship	0.680 (0.64)	0.658 (0.62)
Colonial ties (post 1945)	0.976 (5.92) <sup>***</sup>	1.079 (6.93) <sup>***</sup>
Same country	0.214 (0.84)	0.228 (0.77)
Distance (log)	-1.094 (25.95) <sup>***</sup>	-1.349 (36.10) <sup>***</sup>
Regional trade agreement	0.337 (6.28) <sup>***</sup>	0.322 (6.29) <sup>***</sup>
One WTO member	-0.008 (0.01)	-0.526 (1.78) <sup>*</sup>
Two WTO members	0.051 (0.09)	-0.473 (1.60)
One landlocked country	-0.234 (4.36) <sup>***</sup>	-0.171 (4.12) <sup>***</sup>
Terror event (dummy)	-0.052 (5.62) <sup>***</sup>	-0.021 (3.42) <sup>***</sup>
Constant	-21.858 (3.82) <sup>***</sup>	-21.401 (4.90) <sup>***</sup>
Observations	1,303,371	1,421,411
R-squared	0.74	0.81

Notes: The table reports OLS estimation outcomes replicating the results of Blomberg and Hess (2006). Column (1) uses (log of) OECD imports while column (2) uses (log of) OECD exports as dependent variables. The standard error is clustered at the trading pair level. The terror event dummy variable takes the value of 1 if in at least one country of the pair a terror attack takes place (as in Blomberg and Hess 2006). <sup>\*</sup>/<sup>\*\*</sup>/<sup>\*\*\*</sup> indicates significance at the 10/5/1-% level.

*the economic health of the U.S. and its neighbors. The partnership develops and adopts measures that add security but do not have a chilling effect on trade, a difficult balancing act.*"<sup>15</sup> If companies join the C-TPAT they have to agree to cooperate with the U.S. Customs and Border Protection in order to get checked less frequently which speeds up entry into the U.S. (thus lowering implied trade costs).

The effect of such programs is very difficult to quantify, though. One interesting finding is presented by Globerman and Storer (2009). They show that 9/11 has had some negative effect on U.S.-Canadian trade, but not in ports which utilized the "Fast and Secure Trade" (FAST) program more intensively. This program is similar to the C-TPAT but restricted to U.S.-Canadian border trade.

From a general perspective, the identified effects on trade might be small since we cannot account for government expenses (for military, security, etc.) in order to prevent terrorism due to the lack of available data. Notice that such expenses would modify the approximation in equations (1)-(5), since instead of GDP shares some of the terms would carry modified expenditure shares (net of government expenses for terrorism prevention). However, for the average economy this would still not involve major changes to the results. And for individual countries, the expenses would have to be large (as they arguably are for countries such as Israel) relative to consumption expenditures in order to obtain largely different results from those that have been identified above.

Moreover, one might think that – apart from an economic effect of terrorism through an increase in uncertainty or in transaction costs – there is a disruptive effect on transport and even production infrastructure. However, this effect should be small on average (with the obvious exception of countries such as Israel, Iraq, or Colombia).

Finally, one should take into account that the very nature of terrorism has changed with potential consequences for its economic effects. While targets of terrorism used to be government officials and business, more recent attacks increasingly target random private parties (see Brandt and Sandler, 2010). While this might amplify the shock effect on the population and indirectly increase pressure on government, the associated direct economic consequences for trade might be smaller.

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<sup>15</sup>[http://www.cbp.gov/linkhandler/cgov/trade/cargo/\\_security/ctpat/ctpat\\_program\\_information/what\\_is\\_ctpat/ctpat\\_overview.ctt/ctpat\\_overview.pdf](http://www.cbp.gov/linkhandler/cgov/trade/cargo/_security/ctpat/ctpat_program_information/what_is_ctpat/ctpat_overview.ctt/ctpat_overview.pdf) (last accessed October 25, 2012).

## 6 Conclusions

Revisiting the question whether terrorism bears direct economic costs we analyze to which extent terror deters international trade. In contrast to the existing literature we do not find a strong negative effect of terrorism. We arrive at that conclusion by using monthly (rather than annual or cross-section) data from 1970-2008 using a structural (rather than an ad-hoc) gravity model approach accounting for general equilibrium effects. While our data set is unique this is not the reason for the difference of our findings relative to earlier work. With the data at hand, we are able to replicate previous findings once ignoring the exact (monthly) timing of terror incidents and possible trade responses. This suggests that part of the “common wisdom” about economic effects of terrorism (especially, those with respect to trade) are due to time aggregation bias by way of misattribution of changes of trade in the past to terror events in the future.

To us, the moderate effects of terrorism on trade seem not implausible. While terrorism targeted mainly government officials and business directly, it is relatively more focused on private parties nowadays. Moreover, the average terror event is relatively small and, for countries and country-pairs infrequent. Certainly, that does not mean that terror does not matter. It says, though, that trade might be the wrong domain to look for big effects. While earlier work on terrorism and trade could not address effects of terror beyond trade, the use of a structural model in this paper permits a broader analysis. In fact, the results suggest that, on average, not only the effects of terror on trade but also on income (and, by that token, on growth) are negligible.

The quantitative economic insights from this study also relate to the relatively moderate expenditures on counter-terrorist measures in many developing countries, especially, when being viewed against the background of the analysis of Powell (2007).<sup>16</sup> Counter-terrorist measures are expensive, and developing countries operate under tighter resource constraints than developed countries do. Under such circumstances and in view of the moderate direct economic costs of terrorism, in particular, for trade, it is not surprising that we see little effort on the part of constrained developing economies to engage in counter-terrorist activities, in spite of the potentially high political and societal costs of terrorism.

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<sup>16</sup>See also Sandler and Siqueira (2006).

## Appendix

Table 4: Summary statistics

	Mean	Std. Dev.	Min.	Max.
Imports	5.6E+07	4.3E+08	0	3.4E+10
Exports	5.3E+07	4.2E+08	0	3.4E+10
$\theta$ (partner)	0.006	0.027	0	0.4154
$\theta$ (OECD)	0.029	0.058	0	0.4154
Common border	0.016	0.126	0	1
Common language	0.121	0.326	0	1
Colonial ties (ever)	0.037	0.189	0	1
Current colonial relationship	0.001	0.034	0	1
Colonial ties (post 1945)	0.020	0.141	0	1
Same country	0.004	0.065	0	1
Distance (log)	8.668	0.816	4.088	9.885
Regional trade agreement	0.088	0.283	0	1
One WTO member	0.324	0.468	0	1
Two WTO members	0.668	0.471	0	1
One landlocked country	0.294	0.455	0	1
Two landlocked countries	0.032	0.175	0	1
Terror events (partner)	0.150	1.066	0	136
Terror fatalities (partner)	0.180	3.844	0	378
Terror events (OECD)	0.341	2.035	0	136
Terror fatalities (OECD)	0.184	4.726	0	331
Terror events stock (partnter)	48.81	111.07	0	882
Terror fatalities stock (partner)	42.08	119.55	0	1340
Terror events stock (OECD)	130.82	186.81	0	708
Terror fatalities stock (OECD)	60.80	104.55	0	543
Terror events (partner) GTD	1.149	5.619	0	223
Terror fatalities (partner) GTD	2.720	24.546	0	2996
Terror events (OECD) GTD	1.490	4.907	0	84
Terror fatalities (OECD) GTD	1.199	29.580	0	2996

Notes: The table reports the summary statistics for the monthly data.  $\theta$  is a country's share in word GDP. The lower four rows show the alternative terrorism measures of the Global Terrorism Database (GTD) which includes both domestic and international terrorism.

Table 5: Country composition

<b>OECD countries</b>				
Australia	1970 Germany	1970 Luxembourg	1970 Slovak Republic	1990
Austria	1970 Greece	1970 Mexiko	1970 Spain	1970
Belgium	1970 Hungary	1970 Netherlands	1970 Sweden	1970
Canada	1970 Iceland	1970 New Zealand	1970 Switzerland	1990
Czech Republic	1990 Ireland	1970 Norway	1970 Turkey	1970
Denmark	1970 Italy	1970 Poland	1990 United Kingdom	1970
Finland	1970 Japan	1970 Portugal	1970 USA	1970
France	1970 Korea	1970		
<b>Partner countries</b>				
Afghanistan	1990 Dominica	1990 Lao PDR	1990 Russian Federation	1990
Albania	1990 Dominican Republic	1970 Latvia	1990 Rwanda	1970
Algeria	1970 Ecuador	1970 Lebanon	1990 Samoa	1990
Angola	1990 Egypt	1970 Lesotho	1970 Saudi Arabia	1970
Antigua and Barbuda	1990 El Salvador	1970 Liberia	1970 Senegal	1970
Argentina	1970 Equatorial Guinea	1990 Libya	1990 Seychelles	1970
Armenia	1990 Eritrea	1990 Lithuania	1990 Sierra Leone	1970
Australia	1970 Estonia	1990 Luxembourg	1970 Singapore	1970
Austria	1970 Ethiopia	1990 Macao	1990 Slovak Republic	1990
Azerbaijan	1990 Fiji	1970 Macedonia, FYR	1990 Solomon Islands	1970
Bahamas	1970 Finland	1970 Madagascar	1970 South Africa	1970
Bahrain	1990 France	1970 Malawi	1970 Spain	1970
Bangladesh	1970 Gabon	1970 Malaysia	1970 Sri Lanka	1970
Barbados	1970 Gambia	1970 Maldives	1990 St. Kitts & Nevis	1970
Belarus	1990 Georgia	1990 Mali	1970 St. Lucia	1990
Belgium	1970 Germany	1970 Malta	1970 St. Vincent & the Grenadines	1970
Belize	1970 Ghana	1970 Marshall Islands	1990 Sudan	1970
Benin	1970 Greece	1970 Mauritania	1970 Suriname	1970
Bermuda	1970 Greenland	1970 Mauritius	1990 Swaziland	1970
Bhutan	1990 Grenada	1990 Mexico	1970 Sweden	1970
Bolivia	1970 Guatemala	1970 Micronesia	1990 Switzerland	1990
Bosnia and Herzegovina	1990 Guinea	1990 Moldova	1990 Syrian Arab Republic	1970
Botswana	1970 Guinea-Bissau	1970 Mongolia	1990 Tajikistan	1990
Brazil	1970 Guyana	1970 Morocco	1970 Tanzania	1990
Brunei	1970 Haiti	1990 Mozambique	1990 Thailand	1970
Bulgaria	1990 Honduras	1970 Namibia	1990 Togo	1970
Burkina Faso	1970 Hong Kong	1970 Nepal	1970 Tonga	1970
Burundi	1970 Hungary	1970 Netherlands	1970 Trinidad and Tobago	1970
Cambodia	1990 Iceland	1970 New Zealand	1970 Tunisia	1970
Cameroon	1970 India	1970 Nicaragua	1970 Turkey	1970
Canada	1970 Indonesia	1970 Niger	1970 Turkmenistan	1990
Cape Verde	1990 Iran	1970 Nigeria	1970 Tuvalu	1990
Central African Republic	1970 Iraq	1970 Norway	1970 Uganda	1970
Chad	1970 Ireland	1970 Oman	1970 Ukraine	1990
China	1970 Israel	1970 Pakistan	1970 United Arab Emirates	1970
Colombia	1970 Italy	1970 Palau	1990 United Kingdom	1970
Comoros	1990 Jamaica	1970 Panama	1970 United States	1970
Congo, Rep.	1970 Japan	1970 Papua New Guinea	1970 Uruguay	1970
Costa Rica	1970 Jordan	1970 Paraguay	1970 Uzbekistan	1990
Cote d'Ivoire	1970 Kazakhstan	1990 Peru	1970 Vanuatu	1990
Croatia	1990 Kenya	1970 Philippines	1970 Venezuela	1970
Cuba	1970 Kiribati	1970 Poland	1990 Vietnam	1990
Cyprus	1970 Korea, Rep.	1970 Portugal	1970 Yemen, Rep.	1990
Czech Republic	1990 Kuwait	1970 Puerto Rico	1970 Zambia	1970
Denmark	1970 Kyrgyz Republic	1990 Qatar	1970 Zimbabwe	1970
Djibouti	1990			

Notes: The table reports our sample countries for the OECD, their trading partners, and the year of entry.

Table 6: Trade of OECD countries with the world, zero-inflated Poisson, 1970-2008

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Common border	1.096 (5.16)***	1.138 (5.34)***	1.096 (5.15)***	1.159 (5.18)***	0.621 (2.86)***	0.740 (3.42)***	0.744 (3.35)***
Common language	-0.230 (0.76)	-0.296 (0.94)	-0.230 (0.76)	-0.274 (0.88)	0.384 (0.75)	0.364 (0.68)	0.340 (0.66)
Colonial ties (ever)	0.274 (1.21)	0.292 (1.22)	0.273 (1.21)	0.274 (1.15)	0.141 (0.59)	0.088 (0.33)	0.065 (0.25)
Current colonial relationship	0.713 (0.36)	0.856 (0.44)	0.711 (0.36)	0.643 (0.34)	0.858 (1.15)	1.019 (1.46)	0.742 (1.04)
Colonial ties (post 1945)	0.977 (3.47)***	0.877 (3.02)***	0.979 (3.46)***	1.034 (3.13)***	0.877 (2.24)**	0.881 (2.38)**	1.079 (2.80)***
Same country	1.048 (3.72)***	0.969 (3.36)***	1.048 (3.72)***	0.981 (3.46)***	0.243 (0.64)	0.175 (0.46)	0.217 (0.57)
Distance (log)	-0.166 (1.28)	-0.181 (1.42)	-0.166 (1.28)	-0.161 (1.24)	-0.616 (3.25)***	-0.611 (3.24)***	-0.581 (3.07)***
Regional trade agreement	0.379 (2.45)**	0.425 (2.73)***	0.378 (2.44)**	0.330 (2.13)**	0.634 (2.79)***	0.651 (2.86)***	0.564 (2.47)**
One WTO member	6.160 (5.14)***	4.628 (3.19)***	6.180 (5.16)***	7.126 (5.11)***	12.526 (6.88)***	13.315 (5.51)***	14.095 (7.03)***
Two WTO members	-6.505 (3.45)***	-8.770 (3.69)***	-6.467 (3.44)***	-4.904 (3.17)***	-2.284 (0.95)	0.290 (0.10)	0.811 (0.38)
One landlocked country	-43.091 (3.05)***	-42.069 (2.91)***	-43.082 (3.05)***	-43.932 (3.01)***	-51.787 (4.44)***	-49.088 (4.29)***	-52.637 (4.46)***
Two landlocked countries	-85.699 (3.04)***	-83.754 (2.91)***	-85.680 (3.04)***	-87.428 (3.01)***	-103.257 (4.44)***	-97.962 (4.29)***	-105.008 (4.45)***
Terror events (exporter)	-0.622 (0.83)	0.698 (0.84)			0.679 (0.77)	1.940 (1.95)*	
Terror events (importer)	0.685 (0.88)	-0.623 (0.73)			-0.717 (0.80)	-1.961 (1.98)**	
Terror events stock (exporter), t-1		-0.012 (5.56)***				0.009 (2.04)**	
Terror events stock (importer), t-1		0.018 (4.90)***				-0.014 (4.64)***	
Terror fatalities (exporter)			0.053 (1.32)	0.075 (1.97)**			-0.027 (0.82)
Terror fatalities (importer)			-0.045 (1.33)	-0.068 (1.98)**			0.026 (0.72)
Terror fatalities stock (exporter), t-1				-0.013 (5.09)***			-0.024 (2.52)**
Terror fatalities stock (importer), t-1				0.002 (0.19)			-0.012 (3.53)***
Observations	1,986,094	1,980,694	1,986,094	1,980,694	1,986,094	1,980,694	1,980,694
Non-zero observations	1,303,369	1,301,226	1,303,369	1,301,226	1,421,411	1,418,958	1,418,958

Notes: The table reports the results of zero-inflated Poisson estimations using monthly data from 1970-2008. The sample contains 5,400 trading pairs. Columns (1)-(4) report OECD countries importing goods from the world (including other OECD countries) while columns (5)-(7) show OECD exports to the world. Constant term and time dummies are included but suppressed in the table. Standard errors are clustered at the trading pair level; t-statistics are reported in parentheses below the coefficient. \*/\*\*/\*\* indicates significance at the 10/5/1-% level.



Table 7: Trade of OECD countries with the world: Terror dynamics, z.i. Poisson, 1970-2008

	(1)	(2)	(3)	(4)
	OECD imports		OECD exports	
	Events	Fatalities	Events	Fatalities
Terror (exporter)	0.668 (1.15)	0.053 (1.32)	-0.430 (0.95)	-0.009 (0.24)
Terror (exporter), t-1	-0.855 (2.41)**	0.038 (1.25)	0.091 (0.21)	0.016 (0.39)
Terror (exporter), t-2	0.335 (1.21)	0.007 (0.21)	-0.303 (1.05)	0.029 (0.73)
Terror (exporter), t-3	-0.429 (0.56)	-0.004 (0.11)	0.277 (0.74)	0.041 (1.00)
Terror (exporter), t-4	0.402 (1.17)	0.011 (0.34)	-0.634 (1.63)	0.002 (0.05)
Terror (exporter), t-5	0.025 (0.10)	0.037 (1.29)	-0.178 (0.47)	-0.012 (0.28)
Terror (exporter), t-6	0.091 (0.23)	0.027 (0.84)	-0.505 (1.15)	0.017 (0.46)
Terror (exporter), t-7	0.442 (1.03)	0.031 (0.86)	-0.432 (0.70)	-0.095 (1.98)**
Terror (exporter), t-8	-0.587 (1.37)	2.7E-04 (0.01)	-0.309 (0.69)	0.019 (0.47)
Terror (exporter), t-9	-0.955 (1.32)	-0.012 (0.39)	0.034 (0.09)	-3.8E-04 (0.01)
Terror (exporter), t-10	-1.061 (1.55)	0.022 (0.70)	0.320 (0.72)	0.018 (0.51)
Terror (exporter), t-11	-1.170 (1.52)	0.032 (0.91)	0.505 (0.97)	0.058 (1.33)
Terror (exporter), t-12	-1.118 (1.03)	0.066 (1.71)*	0.312 (0.73)	0.030 (0.72)
Terror (importer)	-0.652 (1.13)	-0.044 (1.32)	0.382 (0.81)	0.004 (0.10)
Terror (importer), t-1	0.924 (2.39)**	-0.019 (0.76)	-0.082 (0.18)	-0.023 (0.48)
Terror (importer), t-2	-0.312 (1.21)	0.004 (0.11)	0.227 (0.77)	-0.036 (0.79)
Terror (importer), t-3	0.402 (0.51)	0.006 (0.21)	-0.307 (0.80)	-0.049 (1.06)
Terror (importer), t-4	-0.371 (1.10)	-0.008 (0.26)	0.571 (1.45)	-0.005 (0.12)
Terror (importer), t-5	0.057 (0.22)	-0.030 (1.18)	0.218 (0.56)	0.012 (0.25)
Terror (importer), t-6	-0.085 (0.22)	-0.021 (0.70)	0.458 (1.05)	-0.022 (0.50)
Terror (importer), t-7	-0.477 (1.12)	-0.024 (0.73)	0.456 (0.76)	0.094 (2.06)**
Terror (importer), t-8	0.650 (1.44)	0.006 (0.20)	0.366 (0.75)	-0.020 (0.44)
Terror (importer), t-9	0.980 (1.36)	0.011 (0.40)	-0.055 (0.14)	-0.001 (0.02)
Terror (importer), t-10	1.127 (1.54)	-0.017 (0.61)	-0.305 (0.71)	-0.023 (0.58)
Terror (importer), t-11	1.232 (1.63)	-0.032 (0.95)	-0.531 (1.02)	-0.078 (1.36)
Terror (importer), t-12	1.216 (1.07)	-0.059 (1.58)	-0.403 (0.92)	-0.047 (0.91)

Notes: See notes to Table 6. The sample contains 5,400 trading pairs, totaling 1,921,294 observations. \*/\*\*/\*\* indicates significance at the 10/5/1-% level.

Table 8: Trade of OECD countries with the world: Extd. terror dynamics, Poisson, 1970-2008

Dependent variable Terror measure	(1)	(2)	(3)	(4)	(1')	(2')	(3')	(4')
	Exporter coefficients				Importer coefficients			
	Imports Events	Imports Fatalities	Exports Events	Exports Fatalities	Imports Events	Imports Fatalities	Exports Events	Exports Fatalities
Terror	0.673 (0.95)	0.027 (0.69)	-0.257 (0.50)	0.008 (0.21)	-0.593 (0.84)	-0.021 (0.58)	0.370 (0.70)	-0.010 (0.25)
Terror, t-1	-1.018 (2.63)***	0.008 (0.29)	0.457 (1.33)	0.034 (0.86)	1.124 (2.66)***	0.005 (0.19)	-0.416 (1.20)	-0.040 (0.91)
Terror, t-2	0.348 (1.19)	-0.011 (0.32)	-0.181 (0.53)	0.040 (1.10)	-0.262 (0.92)	0.019 (0.58)	0.250 (0.71)	-0.041 (1.05)
Terror, t-3	-0.306 (0.37)	-0.007 (0.21)	0.552 (1.70)*	0.037 (1.09)	0.324 (0.38)	0.011 (0.31)	-0.493 (1.50)	-0.032 (0.92)
Terror, t-4	0.339 (0.95)	-0.011 (0.32)	-0.557 (1.52)	0.012 (0.33)	-0.271 (0.75)	0.011 (0.32)	0.621 (1.67)*	-0.014 (0.36)
Terror, t-5	-0.172 (0.43)	0.020 (0.63)	0.227 (0.68)	0.005 (0.11)	0.281 (0.66)	-0.018 (0.60)	-0.179 (0.54)	-0.008 (0.17)
Terror, t-6	0.289 (0.59)	0.001 (0.02)	-0.445 (0.92)	0.034 (0.99)	-0.237 (0.49)	0.001 (0.04)	0.503 (1.02)	-0.040 (1.02)
Terror, t-7	0.673 (1.21)	0.009 (0.22)	0.010 (0.02)	-0.086 (1.87)*	-0.704 (1.27)	-0.008 (0.21)	0.009 (0.02)	0.084 (1.95)*
Terror, t-8	-0.304 (0.49)	-0.026 (0.83)	-0.022 (0.07)	0.036 (0.88)	0.402 (0.63)	0.028 (0.93)	0.073 (0.22)	-0.038 (0.87)
Terror, t-9	-0.577 (1.26)	-0.033 (1.01)	0.320 (1.29)	0.017 (0.49)	0.634 (1.38)	0.030 (0.94)	-0.322 (1.27)	-0.021 (0.56)
Terror, t-10	-0.951 (1.46)	-0.003 (0.11)	0.462 (0.95)	0.035 (1.04)	1.057 (1.51)	0.004 (0.12)	-0.374 (0.80)	-0.041 (1.12)
Terror, t-11	-1.206 (1.66)*	0.005 (0.14)	0.520 (1.12)	0.063 (1.67)*	1.299 (1.79)*	-0.009 (0.26)	-0.438 (0.96)	-0.078 (1.78)*
Terror, t-12	-0.787 (0.74)	0.044 (0.99)	0.183 (0.53)	0.033 (0.95)	0.928 (0.84)	-0.041 (0.95)	-0.141 (0.41)	-0.042 (1.11)
Terror, t-13	-2.421 (2.59)***	0.081 (1.70)*	0.976 (2.36)**	0.062 (0.83)	2.434 (2.61)***	-0.073 (1.56)	-1.036 (2.46)**	-0.068 (0.89)
Terror, t-14	-0.797 (1.12)	0.058 (1.37)	0.558 (1.32)	0.064 (0.81)	0.806 (1.15)	-0.061 (1.36)	-0.532 (1.28)	-0.082 (1.02)
Terror, t-15	-1.769 (1.06)	0.080 (2.59)***	0.320 (0.63)	0.017 (0.26)	1.802 (1.09)	-0.085 (2.60)***	-0.409 (0.80)	-0.014 (0.21)
Terror, t-16	-1.497 (1.08)	0.114 (3.31)***	0.050 (0.12)	0.035 (0.54)	1.547 (1.13)	-0.102 (3.18)***	-0.002 (0.01)	-0.043 (0.65)
Terror, t-17	-0.983 (1.00)	0.086 (2.19)**	0.749 (1.93)*	0.092 (1.10)	0.912 (0.93)	-0.068 (1.97)**	-0.881 (2.13)**	-0.098 (1.16)
Terror, t-18	-1.458 (1.61)	0.097 (2.34)**	0.242 (0.73)	0.044 (0.64)	1.482 (1.66)*	-0.082 (2.10)**	-0.327 (0.99)	-0.055 (0.78)
Terror, t-19	0.081 (0.13)	0.067 (1.34)	-0.197 (0.32)	0.051 (0.71)	-0.062 (0.10)	-0.054 (1.14)	0.082 (0.13)	-0.066 (0.91)
Terror, t-20	0.190 (0.22)	0.109 (2.92)***	0.485 (0.85)	0.131 (1.86)*	-0.262 (0.29)	-0.103 (2.71)***	-0.508 (0.88)	-0.142 (1.97)**
Terror, t-21	-0.938 (1.02)	0.046 (1.25)	0.128 (0.22)	0.032 (0.91)	0.981 (1.05)	-0.042 (1.16)	-0.201 (0.34)	-0.036 (0.96)
Terror, t-22	1.461 (1.06)	0.070 (1.30)	-0.451 (0.67)	0.033 (0.91)	-1.500 (1.08)	-0.070 (1.27)	0.459 (0.67)	-0.044 (1.06)
Terror, t-23	2.105 (1.78)*	0.020 (0.52)	-0.498 (0.61)	-2.09E-04 (0.00)	-2.203 (1.83)*	-0.010 (0.27)	0.428 (0.51)	-0.009 (0.17)
Terror, t-24	0.841 (0.67)	-2.1E-04 (0.01)	-1.019 (1.66)*	-0.008 (0.20)	-0.901 (0.71)	0.009 (0.29)	1.002 (1.65)*	0.005 (0.10)

Notes: See notes to Table 1. The sample contains 5,400 trading pairs, totaling 1,856,494 observations. \*/\*\*/\*\* indicates significance at the 10/5/1-% level.

Table 9: Trade of OECD countries with the world: Extd. terror dynamics, z.i. Poisson, 1970-2008

	(1)	(2)	(3)	(4)	(1')	(2')	(3')	(4')
	Exporter coefficients				Importer coefficients			
Dependent variable	Imports	Imports	Exports	Exports	Imports	Imports	Exports	Exports
Terror measure	Events	Fatalities	Events	Fatalities	Events	Fatalities	Events	Fatalities
Terror	1.009 (1.51)	0.055 (1.34)	-0.745 (1.52)	-0.010 (0.29)	-0.943 (1.43)	-0.046 (1.33)	0.847 (1.67)*	0.008 (0.20)
Terror, t-1	-0.765 (2.03)**	0.039 (1.26)	0.232 (0.58)	0.018 (0.43)	0.846 (2.06)**	-0.020 (0.77)	-0.215 (0.53)	-0.027 (0.49)
Terror, t-2	0.493 (1.79)*	0.011 (0.31)	-0.499 (1.53)	0.020 (0.56)	-0.428 (1.60)	0.002 (0.05)	0.549 (1.61)	-0.020 (0.50)
Terror, t-3	-0.160 (0.21)	0.007 (0.20)	0.302 (0.92)	0.021 (0.62)	0.161 (0.21)	0.001 (0.02)	-0.266 (0.80)	-0.013 (0.38)
Terror, t-4	0.556 (1.68)*	0.005 (0.16)	-0.825 (2.19)**	-0.000 (0.01)	-0.509 (1.54)	-0.002 (0.06)	0.864 (2.26)**	-0.002 (0.04)
Terror, t-5	0.051 (0.14)	0.034 (1.15)	-0.043 (0.13)	-0.009 (0.20)	0.040 (0.10)	-0.027 (1.04)	0.078 (0.24)	0.004 (0.08)
Terror, t-6	0.447 (0.94)	0.022 (0.71)	-0.703 (1.46)	0.018 (0.48)	-0.408 (0.87)	-0.016 (0.53)	0.744 (1.51)	-0.023 (0.50)
Terror, t-7	0.660 (1.36)	0.029 (0.80)	-0.237 (0.42)	-0.100 (2.22)**	-0.707 (1.47)	-0.022 (0.67)	0.236 (0.44)	0.100 (2.32)**
Terror, t-8	-0.271 (0.48)	-0.000 (0.01)	-0.186 (0.58)	0.015 (0.38)	0.349 (0.59)	0.007 (0.24)	0.217 (0.65)	-0.015 (0.32)
Terror, t-9	-0.607 (1.27)	-0.015 (0.51)	0.215 (0.84)	0.001 (0.02)	0.644 (1.34)	0.015 (0.53)	-0.235 (0.89)	-0.003 (0.08)
Terror, t-10	-0.796 (1.39)	0.020 (0.64)	0.290 (0.64)	0.018 (0.52)	0.885 (1.43)	-0.014 (0.52)	-0.219 (0.50)	-0.023 (0.57)
Terror, t-11	-1.005 (1.47)	0.025 (0.76)	0.376 (0.83)	0.054 (1.21)	1.082 (1.59)	-0.025 (0.79)	-0.311 (0.70)	-0.073 (1.23)
Terror, t-12	-0.564 (0.59)	0.066 (1.69)*	0.086 (0.26)	0.021 (0.60)	0.682 (0.68)	-0.057 (1.53)	-0.065 (0.20)	-0.031 (0.76)
Terror, t-13	-2.125 (2.51)**	0.110 (2.51)**	0.837 (2.10)**	0.035 (0.49)	2.124 (2.52)**	-0.097 (2.29)**	-0.916 (2.24)**	-0.041 (0.54)
Terror, t-14	-0.762 (1.16)	0.078 (2.14)**	0.434 (1.10)	0.046 (0.60)	0.762 (1.18)	-0.079 (2.00)**	-0.417 (1.07)	-0.065 (0.83)
Terror, t-15	-1.475 (0.96)	0.093 (3.38)***	0.174 (0.36)	-0.009 (0.14)	1.499 (0.99)	-0.099 (3.39)***	-0.282 (0.59)	0.015 (0.24)
Terror, t-16	-1.305 (1.02)	0.139 (4.08)***	-0.170 (0.40)	0.017 (0.27)	1.338 (1.05)	-0.121 (3.96)***	0.205 (0.48)	-0.029 (0.44)
Terror, t-17	-0.658 (0.74)	0.113 (3.00)***	0.613 (1.64)	0.068 (0.86)	0.579 (0.66)	-0.088 (2.76)***	-0.761 (1.86)*	-0.075 (0.92)
Terror, t-18	-1.315 (1.57)	0.125 (3.16)***	0.158 (0.50)	0.032 (0.48)	1.336 (1.62)	-0.102 (2.84)***	-0.250 (0.80)	-0.046 (0.65)
Terror, t-19	0.218 (0.39)	0.095 (2.08)**	-0.293 (0.52)	0.039 (0.56)	-0.208 (0.38)	-0.076 (1.77)*	0.155 (0.26)	-0.060 (0.82)
Terror, t-20	0.374 (0.46)	0.127 (3.78)***	0.292 (0.54)	0.118 (1.71)*	-0.469 (0.57)	-0.116 (3.43)***	-0.343 (0.62)	-0.132 (1.78)*
Terror, t-21	-0.768 (0.97)	0.069 (2.08)**	-0.028 (0.05)	0.011 (0.32)	0.803 (0.99)	-0.061 (1.89)*	-0.055 (0.10)	-0.014 (0.36)
Terror, t-22	1.429 (1.16)	0.086 (1.83)*	-0.528 (0.83)	0.018 (0.48)	-1.481 (1.19)	-0.083 (1.66)*	0.520 (0.80)	-0.029 (0.63)
Terror, t-23	1.974 (1.87)*	0.047 (1.29)	-0.547 (0.69)	-0.014 (0.27)	-2.089 (1.94)*	-0.031 (0.89)	0.470 (0.57)	0.002 (0.03)
Terror, t-24	0.975 (0.84)	0.030 (0.92)	-1.143 (1.97)**	-0.029 (0.73)	-1.044 (0.89)	-0.014 (0.48)	1.113 (1.93)*	0.028 (0.61)

Notes: See notes to Table 6. The sample contains 5,400 trading pairs, totaling 1,856,494 observations. \*/\*\*/\*\* indicates significance at the 10/5/1-% level.

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