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**International Trade, Security and Transnational Terrorism:  
Theory and Empirics**

by

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## **Abstract**

In this paper, we offer a general analytical framework illustrating the complex two-way interactions between trade and transnational terrorism. We then survey the recent economic literature in light of this framework by pointing to the importance in empirical studies a) to control appropriately for these interactions, b) to distinguish between "source" countries and "target" countries of terrorism and c) to take into account the intertemporal persistence of terrorism between specific pairs of countries.

**JEL classification:** F12, F13

**Keywords:** Terrorism, trade, security

## **Outline**

- 1. Introduction*
- 2. International Integration and Transnational Terrorism*
- 3. The Impact of Transnational Terrorism on Trade Integration*
- 4. The Reverse Impact of Openness on Terrorism*
- 5. Security, Trade and Transnational Terrorism*
- 6. Conclusion*

## Non-Technical Summary

Worldwide trade has increased dramatically in the last three decades with trade volumes as percent of world GDP growing from about 27 percent in 1970 to 45 percent by year 2000. FDI and international financial flows have as well exploded over the same period. The increasing numbers of trucks and container vessels that facilitate international commerce, have therefore certainly enhanced the likelihood of a terrorist successfully smuggling himself or a weapon undetected across a vulnerable border. As well, the growing number of international financial transactions has made it increasingly difficult to international monitoring and interception of money meant to support and finance terrorist activities. These evolutions may have facilitated the development and capacity of terrorist groups to undertake successfully acts of terror in foreign countries.

At the same time, terrorism and the associated anti terrorist policies taken by governments have an impact on costs of doing international business. First, terrorism directly generates anxiety and risks that make people more guarded about the potential harm embedded in any transaction. By the uncertainty on economic returns and transactions that it creates, it is likely to induce reductions or shifts in investment and demand patterns with non negligible implications for trade transactions.

As well, counter terrorist policies tend to multiply the negative impact of terrorism on trading costs. Costly inspections and monitoring, tighter security at airports and seaports increase the costs of travel for both tourists and businessmen and the costs associated with shipping goods, especially when time is factored as a cost. For these reasons, the increased prevalence of transnational terrorism may put into question the process of globalization experienced in the last three decades.

All these developments lead to a number of crucial questions. What are the links between globalization and transnational terrorism? What are the effects of terrorism on international integration? In return, does openness makes transnational terrorism more likely? Which countries seem to be more affected by the linkages between international integration and transnational terrorism?

In this paper, we concentrate on international trade. We set-up a general analytical framework that encompasses most of the existing relations that could exist between terrorism, counter-terrorism actions and trade. In particular, the framework shows that bilateral trade seems to be related not only to the country of location of the incidents, but also to the origin and target countries of those incidents. Besides, several channels seem to impact trade: First, terrorism has a direct transaction cost effect on trade, by reducing the willingness to go into business with agents from an 'unsecure' country (ie. either a country of location, origin or a target country); Second, terrorism impacts trade indirectly, via its effect on counter-terrorism policies that are implemented, in response to terrorism attacks. Third, the terrorist acts affect also indirectly trade through their impact on real GDP.

At the same time, terrorist acts or security measures against those acts are not exogenous. They happen to be the outcome of strategic interactions between terrorist organizations and the authorities at the borders. Our framework then suggests various channels through which trade could in return, affect that outcome by affecting both, the objective functions of terrorists and national authorities.

In a second step, we survey the empirical studies by discussing, in the light of our conceptual framework, the results which are obtained in the literature so far. In particular, we point to the importance in empirical studies: a) to control appropriately for the different interactions which prevail between terrorism, security measures and trade, b) to distinguish between "source" countries and "target" countries of terrorism and c) to take into account the intertemporal persistence of terrorism between specific pairs of countries.

# 1 Introduction

A recent article in the *Economist* (August 20 2005) reminds us with the examples of revolutionary anarchism of the late XIX century that terrorism has always been a fact of life in human history. By their spectacular impact though, the events of September 11 in New York, March 11 in Madrid, or July 7 in London, have brought renewed attention to the phenomenon of transnational terrorism in our modern societies. At the same time, they have induced many observers to question the viability of an open global economy. On the one hand, economic globalization is thought to have contributed to an increased vulnerability of nations to transnational terrorism, while on the other hand, international economic transactions are significantly affected by terrorist incidents and counterterrorist policies.

Indeed, worldwide trade has increased dramatically in the last three decades with trade volumes as percent of world GDP growing from about 27 percent in 1970 to 45 percent by year 2000. FDI and international financial flows have as well exploded over the same period. The increasing numbers of trucks and container vessels that facilitate international commerce, have therefore certainly enhanced the likelihood of a terrorist successfully smuggling himself or a weapon undetected across a vulnerable border. As well, the growing number of international financial transactions has made it increasingly difficult to international monitoring and interception of money meant to support and finance terrorist activities. These evolutions may have facilitated the development and capacity of terrorist groups to undertake successfully acts of terror in foreign countries.

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All these developments lead to a number of crucial questions. What are the links between globalization and transnational terrorism? What are the effects of terrorism on international integration? In return, does openness makes transnational terrorism more likely? Which countries seem to be more affected by the linkages between international integration and transnational terrorism?

While, of course, there is a significant amount of work concerning these issues in political

science, economists have only recently started to assess the economic consequences of terrorism. Yet, most if not all of the work undertaken by economists to investigate the relation between terror and globalization remains empirical.

In this paper, we concentrate on international trade. We set-up a general analytical framework that encompasses most of the existing relations that could exist between terrorism, counter-terrorism actions and trade.

In particular, the framework shows that bilateral trade seems to be related not only to the country of location of the incidents, but also to the origin and target countries of those incidents. Besides, several channels seem to impact trade: First, terrorism has a direct transaction cost effect on trade, by reducing the willingness to go into business with agents from an 'unsecure' country (ie. either a country of location, origin or a target country); Second, terrorism impacts trade indirectly, via its effect on counter-terrorism policies that are implemented, in response to terrorism attacks. Third, the terrorist acts affect also indirectly trade through their impact on real GDP.

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In a second step, we survey the empirical studies by discussing, in the light of our conceptual framework, the results which are obtained in the literature so far. In particular, we point to the importance in empirical studies: a) to control appropriately for the different interactions which prevail between terrorism, security measures and trade, b) to distinguish between "source" countries and "target" countries of terrorism and c) to take into account the intertemporal persistence of terrorism between specific pairs of countries.

The plan of the paper is therefore the following. Section 2 sketches a simple conceptual framework to understand the different channels between international integration and transnational terrorism. Section 3 discusses the empirical studies which have analyzed the impact of transnational terrorism on trade transactions. Section 4 considers then the reverse causality relationship from international integration to transnational terrorism. In section 5, we discuss different issues relating to the endogeneity of counter-terrorist measures and their implications for the estimation of the effects of terrorism on international transactions. Finally section 6 discusses new avenues of research and concludes.

## **2 International Integration and Transnational Terrorism**

In this section, we first present a simple conceptual framework to discuss the links between trade integration and transnational terrorism. This will be useful to organize the recent

economic literature on the topic.

## 2.1 From transnational terrorism to trade flows

In international economics, the workhorse model explaining international transactions, on a bilateral basis, is the gravity model. It is therefore a natural starting point to analyze the impact of transnational terrorism on international activities.

The gravity model is the conventional device to estimate determinants of international flows of goods, services or FDI based on geography and history. Such a model shows how similar borders, geographic configurations and historical patterns are important to describe international transactions between any two countries. In its traditional form, it can be described by the following equation :

$$X_{ijt} = f(Y_{it}, Y_{jt}, y_{it}, y_{jt}, D_{ij}) + \epsilon_{ijt}$$

where  $X_{ijt}$  is the real bilateral flow of international transaction under consideration between country  $i$  and country  $j$  at time  $t$ ,  $Y_{it}$  and  $Y_{jt}$  are real GDP of country  $i$  and  $j$ ,  $y_{it}$  and  $y_{jt}$  are per capita real GDP.<sup>1</sup>  $D_{ij}$  is a generic measure of transaction costs between  $i$  and  $j$ . It includes usually transport costs but may also include all other possible transaction costs, as it will be shown next.  $\epsilon_{ijt}$  is an error term. Generally, researchers estimate the following log linear specification:

$$\ln(X_{ijt}) = \beta_0 + \beta_1 \ln(Y_{it}Y_{jt}) + \beta_2 \ln(y_{it}y_{jt}) + \beta_3 \ln D_{ij} + \epsilon_{ijt} \quad (1)$$

This equation can be given some rigorous microfoundations (Anderson 1979). As the theory suggests and consistent with the empirical results, the parameters  $\beta_1$  and  $\beta_2$  are positive while  $\beta_3$  is negative. Besides, as a hardening of bilateral border generate a mixture of trade-creating and trade-diversion effects between any two countries and their partners, gravity models do not only respond to bilateral trading costs but as well to "multilateral resistance" factors that depend on all bilateral trading costs (Anderson and Van Wincoop 2003).

A first simple way to introduce conceptually the impact of transnational terrorism on international transactions flows is through an increase in trading costs. As already mentioned in the introduction, terrorism activity in one country may affect directly these costs by creating uncertainty and anxiety which induce economic agents to become more guarded about the potential harm of making any transaction in this country. Similarly, any counter terrorist policy exacerbates the impact of a terrorist threat. Inspections and security checking at airports and seaports increase for instance the cost of cross-border transactions. Safety

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<sup>1</sup>Depending on the underlying theory, note that GDP per capita does not always appear in the equation to test.

regulations and controls on goods' and people's international mobility are also making larger the cost of doing international business.

For all these reasons, it seems natural to describe  $D_{ij}$  as an increasing function of terrorism threat in both countries and of security policies taken in both countries. After accounting for other sources of transaction costs, one could formulate  $D_{ij}$  as:

$$D_{ijt} = e^{(\beta_4 B_{ij} + \beta_5 Z_{ij,t})} d_{ij}^\delta [H(T_{it}^e, T_{jt}^e, S_{it}, S_{jt})]^\gamma$$

$B_{ij}$  is a dummy variable that takes a value equal to 1 when the two countries have a common border and is zero otherwise;  $Z_{ij,t}$  is a vector of other factors that include common language, common colonial ties or common institutions, but also time variant factors such as Free Trade Agreements. Accordingly, the parameters  $\beta_4$  and  $\beta_5$  are assumed to be negative.  $d_{ij}$  is a time invariant measure of transport costs, like geographic distance between country  $i$  and  $j$ .  $T_{it}^e$  and  $T_{jt}^e$  are "perceived" threats of terrorism activity in country  $i$  and  $j$  at time  $t$  and  $S_{it}$  and  $S_{jt}$  are levels of security measures taken in country  $i$  and  $j$  as counter terrorist policies at time  $t$ . Reflecting our previous discussion,  $H(\cdot)$  is a function which is increasing in  $T_{it}^e, T_{jt}^e, S_{it}$ , and  $S_{jt}$  (i.e  $\gamma$  and  $\delta$  are positive parameters. ). Equation ( 1) now looks like

$$\begin{aligned} \ln(X_{ijt}) = & \beta_0 + \beta_1 \ln(Y_{it}Y_{jt}) + \beta_2 \ln(y_{it}y_{jt}) + \beta_3' \ln d_{ij} + \beta_4' B_{ij} + \beta_5' Z_{ij} \\ & + \gamma \ln H(T_{it}^e, T_{jt}^e, S_{it}, S_{jt}) + \epsilon_{ijt} \end{aligned}$$

with  $\beta_3' = \beta_3 \delta$  the elasticity of transactions flows on geographic distance. Besides,  $\beta_4' = \beta_3 \beta_4$  and  $\beta_5' = \beta_3 \beta_5$  are the percentage increase in trade due to a common border, or other common institutional and historical factors. As we will see such a type of equation has been estimated by several empirical studies assessing the costs of transnational terrorism on trade or FDI flows.

At this stage, a number of observations should be made. First, we consider that terrorist activities affect directly transaction costs through the threat they represent to economic agents. In other words, it is the " subjective expectation"  $T_{it}^e$  of terrorism that induces economic agents to make trade through mechanisms which are more costly to them privately (incurring for example higher insurance costs). It could be argued though that terrorist activity by its destructive impact on human and physical assets also affects directly trade patterns between countries. Presumably this effect is more likely to come from a reduction of income (or growth of income) in the country where terrorist incidents happen. In that case, we would have to recognize the explicit negative dependence of country GDP  $Y_{it}$  and GDP per capita  $y_{it}$  on observed terrorist activity  $T_{it}$ .

Second, note that the present model does not take into account the difference between "source" countries (countries from where terrorism is emanating) and "target" countries



(countries from where the victims or the assets are residents). As a matter of fact, it is likely that terrorist actions born from a group located in a country  $i$  against the interests of a particular country  $j$ , have more impact on trade flows between these two countries than say, general terrorist activities occurring in country  $i$  or country  $j$ . As well, terrorist activities may not necessarily occur in source country  $i$  or target country  $j$ . They may take place in a third country  $h$ .

To understand these differences, one needs to consider  $T_{ij,t}^k$  the level of terrorist activity from a "source" country  $i$  against a "target" country  $j$  and occurring in a "host" country  $k$ , at time  $t$ . To make the exposition simple, we omit the time index  $t$  in the rest of this section. The host country can either be the country of origin of incidents ( $k = i$ ), the targeted country ( $k = j$ ) or a third country ( $k = h$ ). Then, it is reasonable to think that trade costs between country  $i$  and  $j$  are directly affected by two types of terrorism: the first concerns the total level of terrorist activity occurring in each country  $T^i = \sum_{i',j} T_{i'j}^i$  and  $T^j = \sum_{i,j'} T_{ij'}^j$ . The index  $i'$  refers to all possible source countries perpetrating an act in country  $i$  ( $i' \in \{i, h\}$ ) and  $j'$  refers to all possible target countries hit in country  $j$  ( $j' \in \{j, h\}$ ). The second type is that of terrorism emanating from a given source country against a target country, or "bilateral" terrorism  $T_{ij} = \sum_k T_{ij}^k$ . For instance,  $T^i$  would represent the general "collateral" uncertainty and violence effect of doing business in country  $i$  where there is terrorism, while  $T_{ij}$  would more specifically affect residents of county  $j$  to undertake international transactions with residents of country  $i$ .

Finally, the model here only considers aggregate trade flows between countries  $i$  and  $j$ . But it is clearly possible to disaggregate the gravity model to trade flows at the product/sector line level. Indeed, certain sectors of the economy (like tourism or transportation) may be more sensitive to terrorist activity than others. As well, time sensitive products (like fresh products or products produced under "just-in time" conditions) are more affected by security checks at borders than other more "stockable" goods.

## 2.2 From openness to transnational terrorism

Equations like (1) are useful to understand the impact of terrorist activity on international transactions flows  $X_{ijt}$ . This view considers terrorist activities to be exogenous to international integration and openness. This might not be the case, however. Indeed, the economic approach to terrorism (see for instance Enders and Sandler, 2006) suggests a number of channels through which openness may affect the propensity of transnational acts of terrorism. More precisely, building on the Beckerian economic approach to crime, the economic approach to terrorism assumes that terrorist organizations are rational agents devoting resources to terrorism in order to maximize their political objectives. As usual, these organizations trade off the opportunity costs to put resources into terrorism, and (or) across various

means of terrorist activities, against the "perceived" gains in terms of success, political visibility and political rents. It follows that if international integration changes one or the other side of the equation (opportunity costs and/or "perceived" benefits), then it is likely to affect the level of transnational terrorist activity performed inside a country.

Formally, we may think about the problem of a "terrorist" organization located in country  $i$  as the following problem :

$$\begin{aligned} \text{Max}_{(T_{ijt}^k)} \quad & \sum_{j,k} \Theta_i^v(T_{ij}^k) V_{ij}^k + \Theta_i^{nv}(P_i) V_i^P \\ \text{s.c.} \quad & \sum_{k,j} c_k T_{ij}^k + p_i P_i = R_i \end{aligned}$$

where  $R_i$  are the total resources of the organization,  $T_{ijt}^k$  is the level of terrorist activity of organization  $i$  against residents of country  $j$  in country  $k$ . Index  $v$  designates a violent action while  $nv$  refers to non violence.  $c_k$  is the cost to undertake terrorism in the "host" country  $k$ ,  $\Theta_i^v(T_{ij}^k)$  is the probability for group  $i$  to reach its objective  $V_{ij}^k$  through terrorism.  $P_i$  is the amount of "pacifist" non violent political activity,  $p_i$  is the cost of non violent action faced by  $i$  while  $\Theta_i^{nv}(P_i)$  is the probability to reach, through non violence actions, the objective  $V_i^P$ . As usually assumed,  $\Theta_i^v(\cdot)$  and  $\Theta_i^{nv}(\cdot)$  are increasing concave functions of their arguments. The solution of this programme is straightforward and provides a system of equations:

$$\begin{aligned} \Theta_i^{v'}(T_{ij}^k) V_{ij}^k & \leq \lambda c_k \text{ and } T_{ijt}^k \geq 0 \\ \Theta_i^{nv'}(P_i) V_i^P & \leq \lambda p_i \text{ and } P_i \geq 0 \\ \sum_k c_k T_{ij}^k + p_i P_i & = R_i \end{aligned} \tag{2}$$

where  $\lambda$  is the usual lagrange multiplier of the "resource" constraint.

From this, one derives equilibrium levels of terrorist activity  $T_{ij}^k(\mathbf{c}_{ij}, p_i/V_i^P, R_i)$  with  $\mathbf{c}_{ij}$  the vector of cost-visibility ratios  $\left[ \frac{c_k}{V_{ij}^k} \right]_k$  to target residents of a "target" country  $j$  by a terrorist group of a "source" country  $i$ . As known from this literature (Enders and Sandler, 2006), the level of terrorist activity occurring in one country  $k$  against residents from  $j$  depends on the whole set of cost-visibility ratios  $\left[ \frac{c_l}{V_{ij}^l} \right]_l$  in all countries, reflecting the capacity of "substitution of terrorist actions" across countries. As is also expected, terrorism at large depends positively on the cost-visibility ratio  $\frac{p_i}{V_i^P}$  of non violent political action. When that ratio is low enough, one may actually obtain a situation in which the organization does not undertake terrorism and  $T_{ij}^k = 0$ <sup>2</sup>. Finally, note that in this simple setting, *ceteris paribus*,

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<sup>2</sup>This happens when the following condition is satisfied:  $\frac{V_j^P}{p_i} \leq \left[ \frac{\Theta_i^{nv'}(\frac{R_i}{p_i})}{\Theta_i^{v'}(0)} \right] \text{Min}_k \left[ \frac{c_k}{V_j^k} \right]$

terrorist activities depend positively on the amount of resources  $R_i$  of the organization.

In principle, international integration can affect terrorist levels in various ways. First, globalization is likely to affect positively or negatively the resource  $R_i$  (human and material) at the disposal of the organization. One may assume that the organization's financial means depend on trade smuggling and money laundering (which is for example likely to be the case of Al-Queda). Then, by making markets more integrated, globalization might facilitate such transactions thereby, stimulating terrorist activity. On the opposite, it could be that larger economic competitive pressures induced by globalization forces, erode the sources of funding of the organization and therefore affect negatively its activities.

Second, globalization may as well affect the relative costs-benefits structure of committing terrorism against a particular target. On the 'benefits' side, the globalization of media exposure may increase the value  $V_{ij}^k$  of political rents and visibility that groups may expect to obtain through terrorism.

On the 'costs' side, globalization affects both directly and indirectly the cost structure of undertaking a terrorist action. To begin with, bilateral trade flows  $X_{ij}$  between country  $i$  and  $j$  are likely to increase the mobility of people and/or assets across those countries. This tends to reduce the cost  $c_i$  or  $c_j$  of committing terrorist actions in country  $i$  or  $j$ : first, because there are now more targets (business men or assets) from country  $j$  in country  $i$ , making it easier to undertake terrorist actions in country  $i$ ; second, because the flow of people and assets going through the border between countries  $i$  and  $j$ , facilitates the undercover preparation of a terrorist action in any of the two countries.

International trade and capital flows also affect more indirectly the cost structure ( $c_k$ ). Indeed, one obvious impact of international integration is to modify factor prices inside an economy. Depending on the factor endowment structure of the country and the technologically determined input composition of various terrorist actions in terms of these factors, the value to commit a particular terrorist act in a given country  $k$  may be increased or decreased. Clearly, this may as well affect the relative cost of entering into terrorism versus not doing so, impacting for example the opportunity cost to recruit individuals as terrorist agents.

Our preceding discussion suggest therefore many reasons to expect transnational terrorism to be partly endogenous to bilateral transactions flows and more generally international openness. The following section considers another potential source of endogeneity, namely the fact that counterterrorist policies and security measures are themselves reactions of national governments triggered by terrorist events.

### **2.3 Counterterrorist policies and international integration**

An important channel through which transnational terrorism affects international transactions is the way governments of "target" countries react and implement counterterrorist policies. Two dimensions are important to discuss in this perspective. The first one is the financing costs of increased government spending on security. The second is the trade costs

on international transactions implied by these measures.

The first dimension is certainly going to be increasingly salient for target economies. For instance, after 9/11, the United States created the department of Homeland Security. While most of the activities contained within the new department were already assigned to existing departments and agencies prior to the terrorist attacks, new activities have been added and the financing of older ones have been given top priority. Budgetary outlays for homeland security jumped from \$15 billion in 2001 prior to 9/11 to about \$32 billion in 2003. Government and private spending on security is expected to grow by between 100 and 200 per cent by the end of the decade (Chaffin 2004). On the macroeconomic side, government spending (especially if financed by public debt) has of course a short run demand-stimulating impact. In the long run though, as resources are diverted from investment to spending, it is likely to affect negatively growth and national income (Blomberg, Hess and Orphanides, 2004). Through this income channel, bilateral international trade flows might be negatively affected. The strength of this effect on international integration therefore depends on the growth impact of counterterrorist policies and the importance of the income effect on international trade flows.

The second dimension is subject to more discussion by international trade economists. As casual observations suggest, security measures are likely to impose additional transaction costs on international trade flows. For instance, again just after 9/11, the national border was completely shut down for hours, creating obviously total disruption of international economic transactions with the US. More recurrently, it is reported that the impact of tighter US visa requirements on migration flows created severe time delays for many companies trading with the US (*Financial Times 2004, June 2*).

Whatever the channel, it is important to stress that the level of security measures and expenditures devoted by governments to counterterrorism is indeed endogenous to terrorists' actions. As a matter of fact, one may reasonably expect that, given expectations on the likelihood of terrorist activities, counterterrorist policies are the outcomes of public decisions taking into account the costs and benefits of such policies.

Formally, one may assume that the government of a particular country  $i$  is concerned both by some measure of the economic welfare  $U_i$  and the security level  $\Phi_i$  of his representative citizen. As previously discussed, security measures  $S_i$  decided by that government on his own territory, have fiscal and transaction costs that affect negatively  $U_i$ . At the same time though,  $S_i$  increases the level of security of national residents,  $\Phi_i$ , against terrorism. At the optimum, the government tradeoffs the marginal economic cost of counterterrorist policies against the marginal security gain of such a measure.

Considering this line of reasoning, three elements can then be formally shown. First, consistent with the very aim of terrorist organizations, the security level  $\Phi_i$ , of national

citizens of country  $i$  depends negatively on terrorist activities  $T_i = \sum_{j,k} T_{ji}^k$  planned against  $i$ . Therefore, we may expect that the optimal level of security  $S_i$  implemented by country  $i$  to depend on  $T_i$ : the bigger the value of  $T_i$ , the larger should be the marginal security gain from counterterrorist policies and the larger the value of  $S_i$ .

Second, as far as security measures affect negatively international transactions between country  $i$  and its trading partners, the distortionary costs of security will depend on the volume of trade of country  $i$  with other countries. The larger the volume of trade, the larger the distortionary costs of security policies. It follows from the preceding discussion that counterterrorist policies  $S_i$  are both a positive function of expected terrorism against country  $i$  and a negative function of bilateral trading flows between  $i$  and its trading partners:

$$S_i = S_i \left[ T_i^+, (X_{ij}^-)_j \right] \quad (3)$$

The third point to notice is simply that counterterrorist policies by a country  $i$ , are expected to increase the cost  $c_i$  for any terrorist organization to undertake terrorism in that country. Hence, the behavior of a terrorist organization as described in programme (2) is negatively affected by  $S_i$ . In other words, the equilibrium vector of terrorist activities against  $i$ ,  $\mathbf{T}_i = [T_{ji}^k]_{jk}$  are as well endogenous to the vector of security levels  $\mathbf{S} = ([S_i]_i$  of the various countries in the world (through the fact that the vector of costs  $\mathbf{c} = [c_i(S_i)]_i = \mathbf{c}(\mathbf{S})$  depends negatively on  $\mathbf{S}$ ).

More generally, the preceding discussion suggests that a full model of interactions between trade flows and terrorism  $\mathbf{T} = [T_{ij}^k]_{ijk}$  should come at as the combination of a model of bilateral trade flows (like the gravity model) embedded into a strategic game between terrorist organizations located in different countries and national governments of source, location or target countries. Hence we should expect,

$$\mathbf{X} = f(\mathbf{Y}, \mathbf{y}, \mathbf{D}) + \epsilon \quad (4)$$

$$\mathbf{D} = D(\mathbf{d}, \mathbf{T}, \mathbf{Z}, \mathbf{S}) \quad (5)$$

$$\mathbf{Y} = Y(\mathbf{T}, \mathbf{S}) \text{ and } \mathbf{y} = y(\mathbf{T}, \mathbf{S}) \quad (6)$$

$$\mathbf{T} = T(\mathbf{X}, \mathbf{S}) \text{ and } \mathbf{S} = S[\mathbf{T}, \mathbf{X}] \quad (7)$$

Equation(4) is the standard system of gravity equations with,  $\mathbf{X} = [X_{ij}]_{ij}$  is the matrix of trade flows,  $\mathbf{Y} = [Y_i]_i$ , and  $\mathbf{y} = [y_i]_i$ , are respectively the vector of GDP, GDP per capita and the matrix of trade costs across countries. (5) describes how bilateral trade costs depends on  $\mathbf{d} = [d_{ij}]_{ij}$  bilateral geographic distance,  $\mathbf{Z} = [Z_{ij}]_{ij}$  the matrix of exogenous bilateral

characteristics across countries,  $\mathbf{T} = [T_{ij}^k]_{ijk}$  the matrix of terrorism activity and the vector of security measures  $\mathbf{S} = [S_i]_i$ .

Equation (6) captures the fact that terrorist activity may have macroeconomic consequences on GDP and GDP per capita directly (by the destruction of goods or human and physical assets) or indirectly by the fiscal implications of counter terrorist actions  $\mathbf{S}$ . Finally, equation (7) reflects the idea that terrorist activities and security measures are interdependent and the result of a strategic game between terrorist organizations and national governments.  $\mathbf{T} = T(\mathbf{X}, \mathbf{S})$  is the "reaction" curve of terrorism to security measures while  $\mathbf{S} = S[\mathbf{T}, \mathbf{X}]$  is the "reaction curve" of security policies to terrorist actions. For various reasons discussed above, both can be affected by globalization and trade flows  $\mathbf{X}$  in particular.

It is obviously difficult to estimate a system like (4), (5), (6) and (7). As will be seen, the empirical literature always focuses on one particular aspect of this system and/or makes specific identification assumptions to estimate the links between transnational terrorism and international trade.

### 3 The impact of transnational Terrorism on trade integration

#### 3.1 Measuring Transnational Terrorism and Stylized facts

Obviously, to measure the effects of transnational terrorism on trade flows, one first needs a definition of terrorism and transnational terrorism. As noted by Sandler (2006) definitions of terrorism abound in the literature. Each having its own problems and ambiguities. The *Oxford English Dictionary* defines terrorism as "furthering one's views through acts of coercive intimidation". The US State department uses for analytical purposes the following definition: "Terrorism involves premeditated and politically motivated violence perpetrated against non combatant targets by subnational groups or clandestine agents, usually intended to influence an audience"; while for instance, Krueger and Maleckova (2002) adopt the following one: "the premeditated use, or threat of use, of extreme violence to obtain a political objective through intimidation or fear directed at a large audience". The term "transnational terrorism" applies to terrorist acts involving citizens or the territory of more than one country, either as victims or perpetrators.

One of the most exhaustive definition of transnational terrorism is the one by the ITER-ATE database which defines terrorism acts as "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 governmental authority, when such action is intended to influence the attitudes and behavior of a target group wider than the immediate victims and when, through the nationality or foreign ties of its perpetrators, its location, the nature of its

institutional or human victims, or the mechanics of its resolution, its ramifications transcend national boundaries”.

Whatever the definition, three characteristics are essential to all of them: a) the terrorist act is premeditated and politically motivated, b) it is done with the idea to intimidate an audience larger than the immediate victims, c) It is undertaken by groups which have no sovereign national recognition.<sup>3</sup>

A frequently used indicator to measure terrorism is the number of terrorist incidents. As mentioned by Frey, Luechinger and Stutzer (2004), counting the number of terrorist incidents means that one cannot differentiate between terrorist activities of different magnitudes. One way though to mitigate this problem is to use the number of casualties ( killed or injured people). Another problem of most datasets on terrorist events is the reporting problem. Only events reported in official statistics and the media are counted. This may introduce a bias because governments may not know or may deliberately not report some events. For obvious reasons, this last fact is more likely to happen for authoritarian countries where the freedom on information is limited. As well, the media may only pick up events with high visibility (for instance in big cities, creating an anti-rural bias in this case).

In the case of transnational terrorism, these reporting biases are likely to be less severe as information may be revealed from diverse sources. One of the most frequently used databases on transnational terrorism is ITERATE (International Terrorism: Attributes of Terrorist Events) collected by Mickolus et al. (1989,1993, 2003). It compiles publicly available media source on transnational terrorist incidents and delivers various information on the country of location of each incident, the number and nationality of the victims, the nationality of the terrorist organization (when reported), the type of incident (high-jacking, bombings, hostage taking, etc...). Enders and Sandler (2006) provide a complete discussion of the database and document several empirical facts:

a) There is no obvious upward trend in the number of the incidents. Actually since the late 80s, the number of incidents has been on the decline.

b) The number of casualties per incident has increased significantly in the 90s, meaning that terrorist attacks have become more threatening and lethal. This is attributed to the changing nature of the terrorist organizations. In the 70-80, leftist-based groups and nationalist terrorists wanted to instigate a revolution by getting popular support. Therefore, they were more likely to practice incidents on material assets or on specific targets (military,

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<sup>3</sup>Another element stressed for instance by Omar Malik (2003) from the Royal Institute of International Affairs is the fact that only those incidents that are perpetrated against or within *liberal* states should be qualified as terrorist attacks. A country is said to be liberal when it safeguards human rights in its laws and practices. Qualifying terrorism acts the rest of the incidents against non-liberal countries is usually more controversial. For some observers, these actions might be viewed as terrorism but for others, they might be rather qualified as acts of resistance against a totalitarian country.

businessmen, politicians). The 90s have acknowledged an increased in fundamentalist and suicide terrorism seeking mass casualties to make their cause more widely visible.

c) Terrorist activities seem to be cyclical. In particular logistically complicated acts (like large scale suicide bombings, hijacking of planes and assassinations) have longer cycles than less sophisticated events.

d) Attacks aimed at the United States or US interests constitute a substantial portion of total events (around one third).

e) Transnational Terrorism is a local phenomenon: terrorist groups tend to hit targets that are relatively close to home and/or had big influence on internal policies of origin countries. This has important consequences on how to estimate the impact of transnational terrorism on bilateral trade flows. As proximity and colony (or neo-colony) ties are also known to be factors of trade, one could find some spurious positive relationship between terrorism activities and bilateral trade if those factors are not correctly accounted for.

### 3.2 A first look: trade potentials and terrorism activities

How are trade figures related to terrorism activities? One way to see whether terrorism constitutes an impediment to trade, most likely through an increase in transaction costs, is to compare observed trade between two countries to their trade potential and see if the gap between the two can be related to terrorism activities. Countries that are at the origin of high terrorism activities against a typical economy would experience higher gaps to reach trade potential with the latter. One straightforward way to represent the potential of trade (without going into testable equations) is to set its log as a proportion of the log of a market access index. Thus, by assuming an exporter  $j$  and an importer  $i$  and considering market access to be measured by the ratio of the product of their GDPs over distance, a simple relation of the potential of trade would be:

$$\text{Log}(\text{Potential}_{ij}) = \lambda \text{Log} \left( \frac{\text{GDP}_i \text{GDP}_j}{d_{ij}} \right) + \text{Cst}$$

Then, observed trade in log terms is the sum of its potential and the gap ( $g_{ij}$  hereafter). It can be expressed by:

$$\text{Log}(m_{ij}) = \lambda \text{Log} \left( \frac{\text{GDP}_i \text{GDP}_j}{d_{ij}} \right) + \text{Cst} + g_{ij}$$

Figure 1 plots that relationship for the US as the sole importer with all of its partners pooled over all SITC products and years (around 700,000 points). For the period 1968-2003 at the product level (SITC4/5 digits) it uses data from the NBER World Trade Data compiled by Feenstra and Lipsey and the FLUBIL trade dataset from the French National Institute (INSEE) (basically an updated version to 2003 of the OECD dataset on bilateral trade flows). For each given year, product and partner, the coordinates are represented by



bubbles which size varies with the total number of incidents emanating from each partner against the US over the last 5 years of observation<sup>4</sup>. We consider a stock rather than a flow measure of incidents here in order to wipe out some possible cyclical behavior of terrorism incidents. Besides, this helps removing partly the possible endogeneity over time that exists between terrorism activity and trade. Finally, the gap between observed and potential trade is to be measured by the deviation of each of the bubbles to the slope<sup>5</sup>. The figure does not provide any directly observable pattern consistent with our expectations. That is, the big bubbles are not systematically under the slope. Looking further to these figures one can only distinguish that most of the partners at the origin of high number of incidents are also trading significantly with the US, precisely because of their high trade potential. Thus, the market access for imports seems also to be a market access for terrorism incidents.

Alternatively, and in order to find a way to weep out some of the endogeneity, we may first compute and plot a slope of trade potential for those countries related to groups that have never hit the United States over the last 5 years. This would give the potential of trade with the US for what we shall call 'safe' countries. In a second stage, we can plug into the picture all of the remaining observations corresponding to 'risky' partners (i.e. those which hit the US over the last 5 years). From this we can ask the question of what would have been the volume of exports of those countries had they not been at the origin of the incidents. Figure 2 illustrates this procedure and provides a very clear pattern. Trade with those countries from where emanates the incidents is most systematically lower than their potential if they were to be safe countries. Now, there are many other alternative explanations for this finding: risky countries in terms of their activity of terrorism are likely to be also risky in absolute terms (i.e. bad governance, possible civil war, other political and army conflicts with the US, etc...). In any empirical analysis of the impact of terrorism on bilateral trade flows, one would need to condition out for many of these effects that may alter the relationship between trade and terrorism activities. This is what the recent empirical economic literature on the topic has tried to address

### 3.3 Bilateral Trade flows analyses

Extending the work of Anderson and Marcouiller (1997,2004) on the impact of insecurity on bilateral trade flows, several papers have estimated the impact of terrorist activities as a hidden tax on trade.

To begin with, in the aftermath of September 11, the OECD was particularly concerned by the extent to which the world economy would be hit by the observed increase in security surcharges emanating from Airlines, maritime transport companies or insurers due to the

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<sup>4</sup>We have also considered 3 years and 10 years stock of incidents where the figures remain very similar

<sup>5</sup>Along with the slope, we also represent confidence intervals curves

increase in terrorism threat (OECD (2002a) and (2002b)). They do not though provide any particular estimate of the impact of terrorism on trade.

Walkenhorst and Dihel (2002) is one of the first attempts to tackle the issue. They use a CGE modelling to assess more analytically that impact on trade and welfare. The authors model the costs from a terrorist attack in the same way as an increase in tariffs with the only exception that the former is not accompanied by an additional revenue for the importing government. Where the transaction costs born by terrorism are uniform across regions, the results show not surprisingly that highly opened regions and industries with high import price-elasticities would bear a non negligible adjustment in trade and welfare losses.

A the first study to use a gravity model to assess the impact of terrorism on bilateral trade is Nitsh and Schumacher (2004). In the standard gravity model of (1), they introduce an additional variable, *Terror*, which measures the extent of transnational terrorism occurring in the two countries in the period 1968-1979. More precisely, using the ITERATE database described earlier, the authors construct three alternative variables of terrorist activity: the yearly number of terrorist events in the two countries, the total number of terrorist events during the period, or finally a dummy variable that takes the value of one for at least one terrorist action. They find that terrorist activity negatively affect bilateral trade flows. In particular, they find that a doubling of the number of yearly terrorism attacks in those countries affect their trade by around 4%, holding all other things constant. When one considers the total number of terrorist events in the period, the effect is larger, capturing the trade effects that are not visible in the same year of attacks. When terrorism is finally described by the dummy variable taking values 0, 1, or 2, depending on whether no terrorist event or at least one terrorist event happened in one or both countries, Nitsh and Schumacher estimate that bilateral trade would be reduced by almost 10% if one country is affected by terrorism and 20% if both countries are affected by it.

Using the latter dummy variable of terrorism, Fratianni and Kang (2006) extend the analysis of Nitsh and Schumacher (2004) along two dimensions. First, they consider a different time period (1980-1999) and found actually the terrorism variable to be insignificant, suggesting that the result of Nitsch and Schumacher could be sample specific. Second, they investigate how the terrorist impact on bilateral flows depends on distance. For this, they interact the dummy terrorist variable with distance and with a common border dummy. Formally they estimate :

$$\begin{aligned} \ln(X_{ijt}) = & \beta_0 + \beta_1 \ln(Y_{it}Y_{jt}) + \beta_2 \ln(y_{it}y_{jt}) + \beta_3 \ln d_{ij} + \beta_4 B_{ij} + \beta_5 Z_{ij} \\ & + \beta_6 T_{ijt} + \beta_7 T_{ijt} \ln d_{ij} + \beta_8 T_{ijt} B_{ij} + \epsilon_{ijt} \end{aligned}$$

where  $T_{ijt}$  stands for the dummy terrorism events,  $B_{ij}$  is common border and  $d_{ij}$  is geographic distance. They find that terrorism-related trading costs decline as distance between trade partners increases (ie.  $\beta_7 > 0$ ) while sharing a common border tends to aggravate

impact of terrorism on bilateral trade (ie.  $\beta_8 < 0$ ). All coefficients  $\beta_6 < 0$  and  $\beta_7$  and  $\beta_8$  are statistically significant. Terrorist activities' effect on bilateral trade flows depend on distance and having a common border between trading countries. Although the reasons behind these results are not clear, they imply that terrorism is redistributing trade flows from close to distant partners, thus producing trade diversion effects.

In the same vein, Blomberg and Hess (2004) estimate the cost of violence on bilateral trade flows. Again they use the ITERATE database to measure transnational terrorist activity. But they consider the full period 1968-1999. They again use a dummy variable for terrorism which takes value one if a terrorist event is recorded for either country in a given pair. However, they also consider other sources of violence like external conflicts, revolutions, inter ethnic fighting. They find that all types of violence have a negative impact on trade, but with different levels of magnitude. For instance, a country which has a terrorist accident is associated with a 7.6% decline in bilateral trade. While significant, this is less than half the magnitude of the negative impact on trade from external conflicts and inter-ethnic conflicts.

More interestingly, the authors compare the trade reducing effect of these dimensions to other impediments of trade like tariffs rates. As known from the literature (see for instance Feenstra, 2002), this depends on the value of the elasticity of substitution between domestic and foreign products. Taking "reasonable" values of this elasticity to be between 5 and 10 (Anderson and Van Wincoop, 2003), Blomberg and Hess find that transnational terrorism has a tariff equivalent trade cost between 1 % and 3% while total violence has a tariff equivalent varying from 8% to 19%.

A final important element is the fact that the authors try to control for the endogeneity effect of trade flows on violence and in particular on terrorism, as is transparent from (7) in our basic framework {(4), (5), (6) and (7)}. They use as an instrument for violence, the UN voting records and dummies for peace treaties to obtain much higher coefficients. The magnitude of the coefficients, 10 to 100 times higher, with respect to the variable of violence that is chosen make however the authors cautious not to emphasize more these results. Besides, the use of UN voting records and peace treaties as instruments might be questionable as they could also be related to bilateral trade, independently from being correlated with terrorism.

Several points should be mentioned at this stage.

### **A/ Terrorism, Trade and Common Factors**

The first one has to do with control variables in an equation like 1). As already mentioned, an important stylized fact from transnational terrorism (Sandler and Enders (2002)) is the fact that over the period 1968-2002, and in particular before the nineties, terrorist groups tend to hit targets that were relatively close to home and/or had big influence on internal policies of origin countries.<sup>6</sup> As proximity and colony (or neo-colony) ties are also

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<sup>6</sup>That is in particular the case of some Latin American countries (Colombia, Puerto Rico, Peru, Cuba,

known to be factors of trade, this could give a rapid idea on why one could find some spurious correlation between terrorism activities and bilateral trade if those factors are not correctly accounted for. This, however, is usually well undertaken in the literature, although without being sufficiently documented.

But, what the literature does not usually account for, is the relation between terrorism and the degree of specialization of countries. In fact, it is interesting to see that most of the economies that are source or host of incidents are developing countries that are mainly specialized in agriculture, natural resources and manufacturing employing intensively those resources (ITERATE). Whereas countries like Saudi Arabia, Iran or even Colombia are specialized in Oil production and Oil related products like Plastic (especially Saudi Arabia), Latin American countries in general (including Colombia) exploit intensively some natural resources from Agriculture and Fishing (Argentina, Cuba, Colombia, Chile, Puerto Rico) to Mineral resources (Peru) and Mining (Chile). As differences in specialization between developing and developed countries represent another important factor to trade, this is then another reason why one could retrieve a relationship between terrorism and bilateral trade if the degree of specialization of countries is not controlled for in the trade regression.

This underlines the importance of relevant controls in gravity regressions like (1) and it emphasizes the importance of robustness checks to disentangle the true causality link from transnational terrorism to bilateral trade flows.

## **B/ Income Effects**

A second aspect has to do with the channel through which terrorism is affecting trade. All papers in the above literature describe the effects of transnational terrorism on trade through an increase in trade costs. Therefore, they assume as exogenous GDP and GDP per capital and do not take into account the potential effect of terrorism on trade through the impact on GDP and GDP per capital, as suggested for instance in equation (6). This may in principle, underestimate the effect of transnational terrorist activities on bilateral trade flows.

How big could be the underestimating bias? To get an idea of this, one may start from the literature on the macroeconomic effects of terrorism. Using again the ITERATE data from 1968 to 2000, for instance, Blomberg, Hess and Orphanides (2004) investigate the effect of terrorism on economic growth. In their panel growth regressions with time and country fixed effects, they find that terrorism has a small negative and statistically significant effect on growth rates: a terrorist attack reduces growth by about 0,5 percent in a given year<sup>7</sup>. Interestingly, they note that the impact is associated to a shift from investment expenditures to government spendings and that the negative impact of terrorism in advanced and democratic economies, is smaller than in developing countries).

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Argentina) vis-à-vis the US but also for instance, that of Algeria and Spain vis-à-vis France.

<sup>7</sup>Internal conflicts and external conflicts have much higher impacts (respectively reductions of about 1,4% and 4% of growth in a given year).

This result is somewhat confirmed by Tavares (2004) using the dataset of IPIC (the *International Policy Institute for Counter-Terrorism* (2003)). Under a shorter period 1987-2001 and measuring the incidence of terrorism by the number of terrorist attacks divided by absolute population, Tavares finds that one standard deviation of that variable tends to decrease GDP growth by 0,2%. After controlling for extra growth determinants, however the incidence of terrorism on growth becomes insignificant. On the other end, other catastrophic events like natural disasters and banking / currency crises remain with statistically robust negative effects on GDP growth.

A potential problem however with this set of works is the fact that the variable capturing the incidence of terrorism may not adequately differentiate between the effects of sporadic terrorist attacks and a recurrent and persistent climate of terrorist activities in a country. A different approach therefore is to undertake case studies of economies which have been subject to persistent terrorism for longer periods of time. Abadie and Gardeazabal (2001) evaluate the impact of terrorism on the Basque economy by using the region's characteristics to construct a counterfactual region displaying the hypothetical behavior of the basque economy in the absence of terrorism. Their analysis suggests that the basque region should have had a level of GDP 10% larger has it not experienced terrorism. Similarly, a recent study by Eckstein and Tsiddon (2004) suggests relatively large macroeconomic costs of the Palestinian-Israeli conflict for the Israeli economy (of about 3,5% of GDP).

All in all, it seems that transnational terrorism has a negative impact on GDP levels or growth rates. While on average, the estimated effect is economically modest, the consequences may actually be more significant for regions persistently subject to terrorist events and regions not endowed with well functioning market or political institutions (contrasting therefore the case between developed and developing economies).

What are the consequences for international trade flows? As far as developed economies are concerned, the preceding discussion suggests that the effect of sporadic transnational terrorism on trade through the "income channel" may not be of first order magnitude. However, one may have to be more cautious when transnational terrorist activities affect recurrently the same country or/and that country is economically poor and/or endowed with weak political institutions. In particular, asserting the relative importance of the "GDP channel" versus the "trade cost channel" on trade flows for North South trade remains an area for future empirical investigation.

### **C/ Source, Target and Host Countries**

The studies described earlier are mainly discussing the impact of terrorist's activities on the countries where these events occurred. This type of analysis therefore does not differentiate between countries which are "source" of terrorism (namely countries of residence of the terrorist organization) from targeted countries (countries of residence of most of the victims - assets or human beings- of the terrorist event). This may be quite important, especially when terrorist organizations have targeting strategies against specific foreign interests. Indeed, it

is likely that terrorist actions from  $i$  against the interest of a particular country  $j$  have more impact on trade flows between these two countries than say between country  $i$  and some other country  $k$  for two reasons: first, private behaviors of agents from  $j$  in terms of doing business with agents of country  $i$ , might be more affected when terrorism is expected to come from the latter; second, public policy in terms of counter-terrorism security measures should be also much more targeted towards the country from which authorities expect a terrorism incident. Notice however, that in the previous reported regressions terrorism is generally measured by a dummy variable taking value 1 when at least one terrorist event happens in country  $i$ 's territory. Thus, terrorism is assumed to affect in the same way bilateral flows between  $i$  and any other country irrespective of the targeting feature of the terrorist event. Put differently, the prior regressions are unable to discriminate between the multilateral component effect of a terrorist action located in  $i$  or  $j$  ( $T^i$  or  $T^j$ ) and the bilateral cost of terror ( $T_{ij}^k$ ).

One study which starts indeed to differentiate between source countries and target countries in cross-national studies of terrorism, *albeit* without relating terrorism to trade, is Krueger and Laitin (2003). They use a different dataset than ITERATE, the dataset issued by the US State Department on *Patterns of Global Terrorism*. from 1997 to 2002. Though coding differently terrorist events, the two datasets correlate reasonably well<sup>8</sup>. Looking at the characteristics of the "source" and the "target" countries, Krueger and Laitin find that GDP per capita is significantly related to terrorism for the "target" country but not for the "source country". This confirms previous micro studies (Krueger and Maleckova 2003) that terrorism does not recruit because of poverty or low income. Another interesting result is that lack of civil liberties seems to affect positively and significantly terrorism at the source country level while, interestingly countries with a high level of civil liberties seem to be more vulnerable to terrorism and appear more likely a target during the period. The disparate findings based on country of origin and target country illustrate the importance of investigating separately the determinants of terrorism by origin and target.

In the same vein, another dimension also neglected in previous studies is the fact that terrorist events can occur as well in a third "host" country, (ie. different from the country where the terrorist organization is resident and from the country whose interests are mainly hurt). To illustrate the importance of this phenomenon, figure 3 sketches the distribution of the incidents extracted from the ITERATE database across 3 possible locations (Origin, Target country and Third country). As before, the country is coded as target when it is that of the main nationality of the victims. It is important to note here that victims, in ITERATE, are defined as "those who are directly affected by the terrorist incident by the loss of property, lives, or liberty". Thus, when a French embassy is hit without casualties in say, an African

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<sup>8</sup>Excluding India which involves problems of definition of what is a transnational terrorist incident between India and Pakistan, the two datasets correlate at 0,9 at the level of the place of attack and 0,89 at the country of origin.

country, France is then coded as the target country. Besides, the third country represents the country where the action begins *albeit* different from the origin and target states. From figure 3, we can see that only a small and relatively stable proportion over time (10 to 20%) takes place in the target countries. Attacks like those of New York (2001), Madrid (2003) and more recently London (2005) are not representative of most of the incidents. In the earlier period, around 30 to 50% of the incidents took place in Third countries but that share declined steadily over the period to reach around 20% of the incidents. This reduction seems to be concomitant with the rise of the share of incidents located in origin countries (i.e. where they have been planned and prepared) has been growing steadily. Hence, at the end of the period, 60 to 80% of the incidents became local. These findings are quite similar to those of Krueger and Laitin (2003) who use the Department of State dataset to assert that, in recent years, perpetrators preferred setting-up actions against "targets from foreign countries [that are] close to home". However, even if the third country location is decreasing, it is still highly variable and thus could still matter as much as incidents in origin and target countries for detecting the impact on counter-security measures and trade between them.

It remains that all the trade cost effects of 'bilateral' terrorism, and/or terrorism located in third countries are yet to be investigated.

#### **D/ Endogeneity Problems between Terrorism and Trade**

Finally, it should be notice that, consistent with our system (4), (5), (6) and (7), an important issue is the endogeneity between transnational terrorism and trade flows. This happens for two reasons. First directly, terrorist events are the purposeful outcomes of terrorist organizations which operate in a given socio-economic environment. As already mentioned in section 2, trade openness and globalization may affect in diverse ways this environment. Second, the costs or transnational terrorism come as much from terrorist events as from the security measures which are implemented by governments to counteract terrorism. This as well, is an endogenous decision which could be affected by the economic environment of the country. In both cases therefore, trade flows can affect observed terrorist's outcomes. The next two sections discuss in more details these two dimensions.

## **4 The reverse impact of openness on terrorism**

Our conceptual framework provides many mechanisms for why openness and trade integration in particular may have effects on transnational terrorist activities. From this framework two questions arise: 1/ is the relationship empirically positive or negative? and 2/ which channels are the most relevant? Political scientists and international relations scholars have discussed these questions extensively (see for instance, Midlarsky, Crenshaw and Yoshida 1980, Matthews and Shambaugh 1998, Crenshaw 1981, Martin 2001).

Li and Schaub (2004) is a recent quantitative analysis of the impact of globalization on transnational terrorism. The estimation sample covers 112 countries from 1957 to 1997 and

they use the ITERATE data base to construct a dependent variable which is the number of transnational terrorist event that occur in a country in a year. They capture international integration with three variables: trade openness (measured as the annual sum of exports and imports over GDP), FDI flows (as the sum of absolute values of inflows and outflows over GDP) and portfolio financial flows (the sum of a country's financial flows in equity and debt securities over GDP). They also control for the level of democracy of the country, a composite proxy for the state capability of a country to fight terrorism and a measure of interstate military conflict. Two main results emanate from this study. First, international integration variables do not seem to affect significantly the number of terrorist activities occurring in a country. In other words, greater economic integration of a country does not seem to cause more transnational terrorist accidents within its borders. Second, a country's GDP per capita affects negatively and significantly the number of terrorist events within its borders. More precisely, a 1% increase in the GDP per capita of a country decreases the expected number of transnational terrorist incidents within the country by 19,3%, holding all other variables constant. The interpretation of the authors is therefore that globalization has no direct impact on transnational terrorism but can have indirect negative effects on terrorism insofar as integration stimulates economic growth.

The approach of Li and Schaub (2004) has been criticized by Blomberg and Hess (2005). In particular, the panel estimation of their analysis, does not separate the effect of globalization from the host and the source country perspective. This is related to our previous remark on the issue of differentiating host, source and target countries in transnational terrorism. Indeed, a full understanding of the dynamics of transnational terrorism needs an understanding of the motivation from both the point of view of the source of the attack and from the perspective of the target or host country.

In order to do this, Blomberg and Hess (2005) recognize the dyadic nature of transnational terrorism. Therefore to analyze its determinants, they actually use a gravity model turned on its feet. The dependent variable is a bilateral terrorist variable : the number of events in a host country  $i$  from attackers whose nationality comes from a source country  $j$ , or the number of events perpetrated against residents of a host country  $i$  from attackers whose nationality comes from a source country  $j$ . The independent variables are the standard GDP and GDP per capita of the two countries  $i$  and  $j$ , a measure of distance between them. As well are included indexes of democratization and religious fractionalization, measures of democratization and openness and the countries  $i$  and  $j$ . Three conclusions emerge from their analysis.

First, richer host countries (with larger GDP per capita) generate more terrorism against them whereas richer source countries generate less terrorism. Taken together, this implies that larger income inequality between source and host countries is likely to lead to increased transnational terrorism. Terrorism is the unfortunate result of a widening divide between rich and poor countries. Interestingly, the first part of this result is consistent with the



findings of Krueger and Laitin (2003) namely that richer countries are more likely to be target from transnational terrorism, the second part is not. On the contrary, Krueger and Laitin argue that source country's economic conditions are not significantly correlated with their transnational terrorist activities.

The second result concerns the differential impact of the level of democracy between source and target countries. Democracy is more likely to favor transnational terrorism for a target country while, on the contrary, it is reducing terrorism for source countries. Again the last result is consistent with Krueger and Laitin findings that underdeveloped democratic institutions are an important determinant of terrorism in source countries.

The third result concerns the impact of openness on transnational terrorism. Again, one needs to distinguish between source and target countries. While openness seems to make target countries more vulnerable to terrorism, on the other hand it diminishes the incentives to undertake terrorism in source countries.

These results are interesting at different levels. First, they confirm that openness and trade integration in particular, have an effect on transnational terrorism activities. Therefore, bilateral standard gravity analysis of trade flows regressed on transnational terrorist incidents should control for the endogeneity problem of terrorism on trade.

Second, they provide a more nuanced image of the effect of globalization on transnational terrorism. Indeed, they are consistent both with the negative view that globalization favors the development of transnational terrorism (as it makes target countries more vulnerable) and the positive view that it reduces terrorism (as it reduces the incentives of source countries to commit terrorism).

Interestingly, the first result on the impact of GDP per capita, if robust, provides another indirect channel through which globalization may affect transnational terrorism: its impact on the world distribution of income. As a matter of fact, depending on whether it is a force of convergence or divergence between nations, globalization may reduce or on the contrary exacerbates transnational terrorist activities.

## 5 Security, trade and Transnational terrorism

As already mentioned in section 2, an important element in the costs of transnational terrorism is related to security measures implemented by target governments to counteract terrorism. In principle, these measures are the result of a decision making process by governments which can be affected by the economic environment of the country. In particular, openness may affect the different cost-benefit components of the policy trade-off, which in turn can create a source of endogeneity of the trade costs of terrorism to trade flows, as illustrated in our equations of trade costs  $\mathbf{D} = D(\mathbf{d}, \mathbf{T}, \mathbf{S})$  and our equations of the security game  $\mathbf{T} = T(\mathbf{X}, \mathbf{S})$  and  $\mathbf{S} = S[\mathbf{T}, \mathbf{X}]$ .

Mirza and Verdier (2006) investigate more fully this issue both theoretically and empir-

ically. More precisely, they construct a theoretical model which explicitly describes the strategic interaction between terrorist organizations and the national government of a "target" country. Terrorist organizations invest resources to maximize the probability of success of a terrorist incident. The government implements a certain level of security measures, trading off the benefit of a lower probability of success of terrorism against the distortive effects of security on international trade flows.

The theory enlightens two forces, of different nature, linking negatively trade to security. First, as expected, an increase in security measures affects transaction costs and thus trade. However, the model also captures the fact that in return, a country that is a big importer from a given economy for any given reason (proximity, big size of exporter, differences in specialization, etc...) tends to reduce its security at its borders towards the latter. The argument is that the related total cost of security can end up being higher than the associated gain in the probability of preventing from terrorism attacks.

Trade and terrorism incidents become then endogenous to each other. On the one hand, the relationship is negative: terrorism via an increase in security reduces trade. But on the other, it can be positive: higher trade volumes are more likely to limit security measures which in return increases terrorism activities.

Empirically, Mirza and Verdier (2006) consider the case of the US as a singular "targeted" economy and investigate the impact of transnational terrorism on bilateral trade flows between the US and any "source" country. Given that security measures are not directly observable, the authors construct a proxy based on two terms. The first one is the frequency of past incidents against the US, capturing the idea that the higher is the number of incidents against the US compared to the total number of world incidents in the last years, the lower is the US efficiency to implement security measures that safeguards its citizens and interests over the world. The second is the frequency of past incidents perpetrated by terrorist groups from a given source country in the past, capturing the degree of "technology" efficiency of terrorist group in a given "source" country. An upward shift of any of these variables is expected to help identify the "exogenous" impact of transnational terrorism on bilateral trade through the channel of bilateral counter terrorist policies.

However, recognizing the endogenous relationship that may exist between these terrorism shares and bilateral trade, the authors choose to work with a particular set of incidents that should be much more exogenous to security and trade. Those incidents are past terrorist events located in third countries. Indeed one may expect observations on the share of incidents located in third countries against US interests to be even better instruments for security, and hence should better inform on the true impact of terrorism on security and trade. The main reason is that terrorism in third countries should be much less correlated with insecurity-related events specific to the "source" country, the latter known to be also affecting bilateral trade.

The dependent variable used in the regressions is bilateral US imports in the period 1968-

2000 at the product level (SITC4/5 digits) from the NBER World Trade Data compiled by Feenstra and Lipsey. It is completed by the FLUBIL trade dataset from the French National Institute (INSEE) which is basically an updated version to 2003 of the OECD dataset on bilateral trade flows. Data at the product level are important for two reasons: First, they are used to control for the relative specialization of countries which are suspected to be correlated with both measures (see section 2), bilateral trade and terrorism activities; Second, they are useful to test the expected differential impact of security measures across goods. In fact, the goods that are very sensitive to shipping time or the mobility of businessmen across countries are expected to be much more affected by counter-security measures against terrorism.

Three important results come from the empirical analysis. First, past terrorist acts against the US, perpetrated by groups from a given country, affect significantly American imports from the latter. The effect is nonlinear, however. It is relatively small on average: a 1% increase in past terrorism activities from a country reduces by around 0.01% US imports. But the elasticity is higher the riskier is the country of origin in terms of its related frequency of incidents and the number of victims. In particular, a 1% increase of past incidents from countries such as Colombia over the period results in a more than 1% decrease in their exports to the US. Also, and perfectly consistent with the theory, the past terrorism impact on US imports is higher when the partner country is small in terms of its GDP size.

Second, the level of the impact more than doubles (and hence reaches more than 2% in the case of Columbia) when the acts result in a relatively high number of victims and the products are sensitive to the time-length of shipping and network-lengths.

Finally, the authors identify explicitly one important channel through which anti-terrorist measures affect international trade of manufacturing goods. Using an additional dataset from the Department of State on visa issuance from 1997 to 2002, they show: a) that past terrorist incidents affect the number of Business visas delivered by the US to the "source" country, b) that these visa allocations impact significantly bilateral US imports from "source countries" in differentiated products.

While one of the first "semi-structural" paper to assess the impact of transnational terrorism on international trade flows, the analysis is restricted to the case of bilateral flows between the US and the rest of world. This is justified by the fact that the US is the main "target" country of transnational terrorism and that it is also the "target" country with the largest variation of "source" partners. Still, it would be nice to extend the investigation to more "target" countries. Also, the main idea of the framework is to identify the specifically "bilateral" costs of counter terrorist policy. This does not preclude the existence of more "multilateral" costs of terrorism which are not fully identified in the framework. Finally, the period of estimation is quite long 1968-2003. An implicit identifying assumption of the analysis is the fact that the technology of security and terrorism remained roughly constant during the period. Though the authors try to control for time varying effects, it is well documented that transnational terrorism has changed nature between the 80s and the 90s.

How this shift of regime from separatist groups to fundamentalist and mass suicide terrorism has affected the costs of security and counter terrorist policies on international trade flows, remains therefore to be assessed.

## 6 Conclusion

In this paper, we have surveyed the recent literature on transnational terrorism and international openness. Several issues have emerged from the discussion:

First, it is quite likely that there is a two-way relationship between trade openness and transnational terrorism. On the one hand as expected, transnational terrorism affects negatively bilateral trade flows. Though the effect on average seems to be quite modest, there are good reasons to believe that it is non linear and substantially bigger for countries which are recurrently suffering or committing terrorism.

On the other hand globalization, and more specifically trade integration, impacts as well transnational terrorism. Here, the effect is more nuanced and one needs to recognize the dyadic nature of international relationships and distinguish between source, target and host countries of transnational terrorism. Openness is likely to increase the vulnerability of rich target economies both directly and indirectly through its positive effects on GDP. Conversely, openness is likely to reduce the incentives of "source" countries. The whole effect of globalization on transnational terrorism therefore remains ambiguous and certainly depends on country dyads specific parameters.

Second, the endogeneity between trade flows and transnational terrorism could go as well through the channel of endogenous counter terrorist and security responses of governments of "target" countries. The effect, again, could be strong for recurrent situations of terrorism. As well, it is likely to affect products and sectors quite differently. In particular, time sensitive and network-based products tend to be more strongly affected by security measures and restrictions on the international mobility of business people.

Clearly, many interesting questions remain to be investigated. For instance, interactions between bilateral transnational terrorism, trade diversion and trade reducing effects with respect to trading partners are not fully explicit. Besides, the relationship between patterns of comparative advantage of "source" countries and transnational terrorism has not yet been addressed in the literature.

On the security and counter terrorist policy side, most results have been obtained with indirect proxies for the application of these measures at the borders. It could be nice to have more direct evidence of them and relate them directly to trade flows. Besides, changes in the behaviors of insurers (higher rates of insurance prices), consumers (discrimination) could affect trade consequently to terrorist attacks. All these issues deserve to be further investigated

One of the most promising avenue though could be to go beyond the dyadic view of

transnational terrorism and recognize as well the multilateral nature of international relationships. So far in the literature, each terrorist attack is assigned to one particular "source" country. We know however that this is not anymore true in today's changing forms of terrorism and that terrorist organizations are becoming increasingly more multinational (as the example of Al Qaeda clearly demonstrates). This in turn may produce "contagion" effects from terrorism in one source country over other suspected countries hosting groups from the same 'multinational' organization. Similarly, terrorism specifically directed against one "target" country could spill-over to other countries taking part into a coalition in favor of the initial "target country" Think for instance of how transnational terrorism directed against the US had negative spillovers on the UK and Spain when their governments took foreign policy positions similar to that of the US government. What are the implications of these multilateral effects on international trade flows? What are the countries that are most likely to suffer from these multilateral dimensions of transnational terrorism? What are the consequences for North-South trade patterns? All these questions are important to understand the current dynamics between globalization and transnational terrorism. They certainly await future research to provide some answers.

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Figure 1: Terrorism incidents and the trade gap

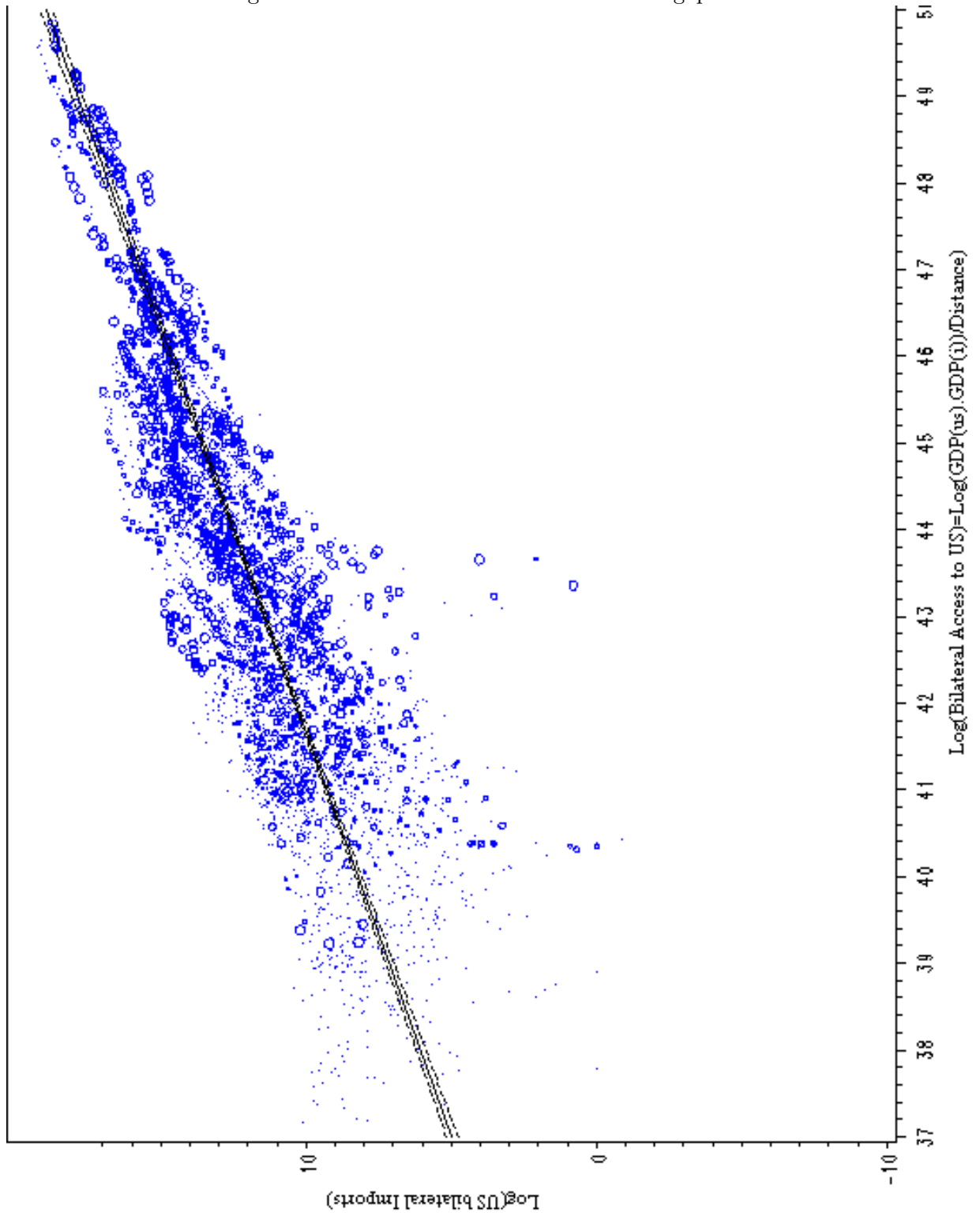




Figure 2: Terrorism incidents and the trade gap to the potential of safe countries

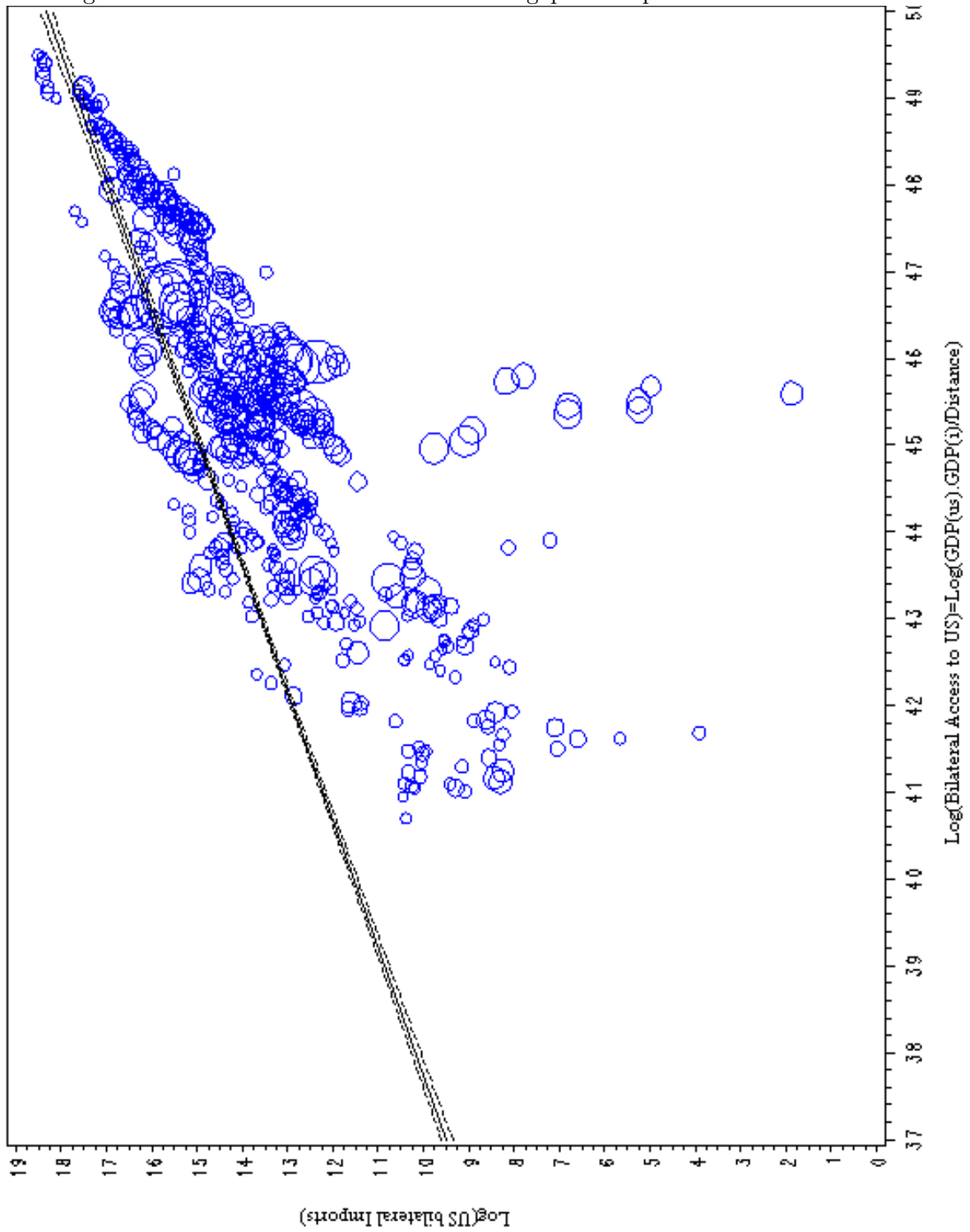


Figure 3: Location of incidents across Origin, Target and Third Countries

