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Terrorist Incidents and Trade

Zahoor Ul Haq* Zia Ullah† Javed Iqbal‡

Abstract *Employing a trade flow data from 1990 to 2013 within 50 countries, this study estimates terrorism effects on trade. The trading countries are grouped as trading partners (a) within developing countries (i.e. South-South), (b) within developed countries (North-North) or (c) within developed and developing countries (i.e. North-South). The analysis shows that all the standard gravity-type variables carry expected sign while the terrorism effect on trade is recorded significant on statistical grounds and negative when South trades with North.*

Key Words:
Terrorism incidents, War Against Terrorism, South-South Trade, North-North

JEL Classification:
F13 Trade Policy, International Trade Organizations, F14 Empirical Studies of Trade

Introduction

Terrorism has been variably defined for example, Buckelew (1984), Enders and Sandler (2002, 2012) and, primarily carried out to disrupt the economic and political process of a nation. Anderson and Marcouiller (1997, 2002) initiated to highlight the nexus between trade and terrorism. They account corruption, poor implementation of contracts, and insecurity as major factors which restrict trade flows. The trade-terrorism negative association may vary in different scenarios, however, the relevant literature exhibit several possible undesirable outcomes associated with terrorism on trade: i) the price of goods may raises due to uncertainty associated with terrorism ii) terrorism incidents increases the cost of business operation, iii) increasing inspections and safeguarding measures for evacuating terrorism threats eventually slows down the flow of goods and resources iv) cost of damage of assets due to terrorism incidents can negatively affect the trade v) government expenditures can be diverted from more efficient to less efficient activities by terrorism incidents which subsequently falling economic growth by influencing export and import activities of a country vi) in

*Professor & Dean, Department of Economics, Abdul Wali Khan University Mardan, Mardan, KP, Pakistan. Email: zahoor.haq1@gmail.com
†Assistant Professor, Department of Hospitality and Tourism Management, Abdul Wali Khan University Mardan, Mardan, KP, Pakistan.
‡Assistat Professor, Department of Economics, Abdul Wali Khan University Mardan, Mardan, KP, Pakistan.

such scenarios, traded goods are always at risk of a direct destruction vii) terrorism reduce the physical and human capital of a country (Frey, et al.2007; Blomberg et al. 2004Enders et al. 2006; Nitsch and Schumacher 2004; Abadie and Gardeazabal, 2008; Blomberg and Hess 2006).

Mirza and Verdier (2008) reported that the volume of trade increased from 27 to 45 % of the world's GDP during the last three decades. During this period, the flow of foreign direct investment also increased. The increase in trade as a result would have increased the number of vessels carrying goods from one destination to another, enhancing the probabilty of the movement of terrorists or therir weapons and raising the terror incidents. Hoffman (1998), Wilkinson (2000), Frey, et al., (2007) and Mirza and Verdier (2008) conlcude that political unrest leads to decay in economic growth.. Berrebi et al. (2010) show that transportation costs associated with exchange of products in the presence of terrorsim increases. However, Bandyopadhyay et al (2017) viewed that trade of primary products has been negligibally influenced by terrorism, while, it substantially reduces trade of manufactured goods.

Becker and Murphy (2011) shown modest effects of September 9-11 on US economy, OECD (2001) finds higher long-run effects of terrorim on an economy. These log-run effects show increases with intensity in terror incidents. Abadiea and Gardeazabal (2008) report that corporate investors consider the incidents of terrorism as an important factor in decision making process for investment. They report that the amounts of FDI inflow in the US in 2000, the year before September 9-11, account for 15.8% of the Gross Fixed Capital Formation (GFCF) in the US which declined to only 1.5% in 2003. While, FDI outflows during the same period increased from about 7.2% of the GFCF to 7.5% in 2003. This is where the case of Pakistan becomes very important as the number of incidents from zero in 1970 increased to 5820 in 2013. However, terrorism incidents in one part of the country could lead to mobility of productive resources from one region o another reducing the direct effect of terrorims on an economy.

Arin et al. (2008) estimates the effect of terror incidents on financial market's behavior. Their study is focused on the effect of terrorism incidents on stock market and stock market volatility. Their analysis shows a large effect of terrorist effect in these countries. They conclude that terrorism incidents have higher effects in emerging markets. Being in the emerging economies of the world, the case of Pakistan can be of vital interest here. With respect to 9/11 incident, the WTTC (2002) has reported that USA has lost $92 billion in tourism, folllowed by Germeny and UK with a loss of $25 and $20 billion, respectively. While explaing the nexus between terrorism and tourism through stated preference model, Arana and Leon (2008) reported that peace is a pre-requisite for the development of tourism. Terrorism has negative impacts on tourism demand. They focus on the short-run impacts of the 9/11 incident on visitors' chioce of tourist destinations in the Mediterranean and the Canary Islands. . They collected

data from at different points in time. The study shows that the attacks cause disutility to tourists' and consequently the change in image of the destinations. They found that some visitors' places experienced a statistically signficant negative effect of terrorist incidents while others improved their services as a result of terror events. Several other reserach studies have also been carried out to explain the connetion between travel trade and terrorism, for example, Enders and Sandler (1992); Eckstein and Tsiddon (2003); Teitler and Bental (2010) and Boulal (2017).

Prieto-Rodríguez et al., (2009) challenged the traditional methods used for measurement of terrorism.They argued, that terrorist incidents can not be account for the non-market values and disutility associated with these incidents. They proposes an index of terrorism built using factors such as number of people died, injured or kidnapped, and also the type and scale of attack.. In order to evaluate the terrorism effects on trade, Nitsh and Schumacher (2004) used a variable having the value of 0, 1 and 2 in a gravity model. In case of a dummy variable, the yearly terrorism attacks affects bilateral trade by around 4 % holding all other variables constant. However, in cases where terrorism effects only one country then the trade is expected to decrease by almost 10 % ,whilst, in others where both countries are affected the trade would be declined by about 20 %. Fratianni and Kang (2006) interrelated the dummy variable with factors like distance and a common border. They found that as the distance between the trading partners increases the resultant trade cost due to terrorism decreases, while, sharing a common border worsen the effects of terrorism on trade. They conclude that terrorism has lead to the redistribution of trade-flows from bordering to distant partners, creating trade diversion effects. Blomberg and Hess (2004) estimated and compared trade effects due to terrorism with tariffs rates. These effects are compared assuming the values of elasticity of substitution between foreign and home country goods as 5 and 10. They find that terrorism has an effect equal to tariff cost of 1 to 3 %. Mirza and Verdier (2008) showed the importance of spillover effects of terrorism on other trading partners who are partner in war against terrorism.

Economy wise effects of terorism on trade are also estimated using CGE models. Walkenhorst and Dihel (2002) assuming tariff equivalent of increase in trade cost due to terrorism and estimated the interrelationships of terrorism trade and welfare using CGE modeling. Their analysis shows that regions and industries having high import price-elasticities face large welafre losses due to terrorism.

This study investigates the effect of the incidents of terrorism on the trade between countries. The study considers 50 countries and covers the period from 1990 to 2013. During this period, 46,783 incidents of terrorism took place in these 50 countries causing 109,846 deaths and 137,230 injured. The period has witnessed the lowest number of incidents of 531 in 1998 to the highest number of

5820 in 2013 (Figure 1). Incidents primarily took place in developing countries included in the data set. A massive increase in the number of deaths in the terrorism incidents has been witnessed between 2004 and 2013, when it increased from 1694 to 9035, respectively.

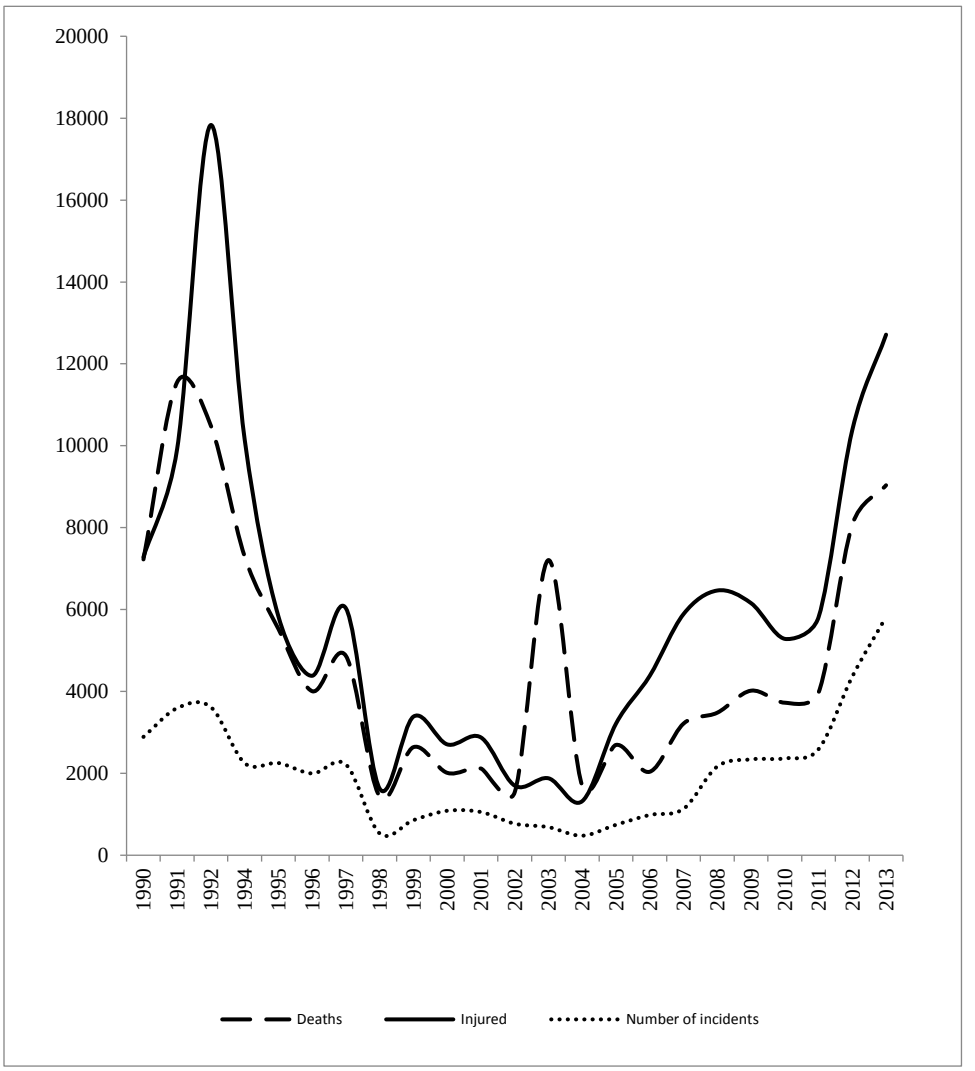

Figure 1: Number of Terrorists Incidence, Deaths and Injured Since 1990 For the Selected Countries

Conceptual and Empirical Models

The Anderson and van Wincoop (2003) gravity equation presumes that goods are distinguished by country of origin, furthermore, each region has its own specility in the production of particular goods. Consumption in country *j* of goods from country *i* (c_{ij}), approximated by constant elasticity of substitution (CES) preferences, is maximized subject to nominal income in country j (y_j), where $y_j = \sum_i p_{ij} c_{ij}$ and p_{ij} is the price of region i's goods for region j's consumers. Trade cost (τ_{ij}) leads to the difference in the price of a good between the two regions such that $p_{ij} = \tau_{ij} p_i$. Constraint optimization of utility function and applying the market clearing conditions yields the following trade flow expression.

$$x_{ij} = \frac{y_i y_j}{y^w}\left(\frac{\tau_{ij}}{P_i P_j}\right)^{1-\sigma} \qquad (1)$$

where x_{ij} represent trade form region *i* to *j*, y_i, y_j and y^w are nominal income of region *i*, *j* and world's income respectively, P_i and P_j are price indices in region i and j and σ is the elasticity of substitution.

The trade cost in equation (1) is approximated empirically using gravity type variables. This study supposed that each region is specialized in the production of one product. However, on average it is a two-way measure of trade cost for both trading partners (Novy, 2011; Anderson and van Wincoop, 2003).

Previous studies such as Haq et. al., (2013), Haq and Meilke (2010), Haq and Meilke (2009) and Hallak (2006) show that τ_{ij} is affected by three different kinds of variables. The first group consists of variables that affect transportation costs. These variables include distance, common border, countries being landlocked etc. The second group consists of factors determining tariff structure between trading partners, such PTAs (Preferential Trade Agreements) while the third group includes other socioeconomic variables such as countries trade partners colonizing each other and common language etc. These studies ignored the effect of security and terrorism on bilateral trade while estimating the effect of above-mentioned variables on trade. This study also considers terrorism incidents in a country for estimating their effect on trade between countries. Controlling for terrorism related variables while estimating the effect of other trade facilitating and resistance variables on bilateral trade is important because inter-temporal persistence of terrorism affects GDP and GDP per capita regressors.

$$\ln\tau_{ij} = \beta_1 \ln dist_{ij} + \beta_2 DCB_{ij} + \beta_3 Dlandl_i + \beta_4 DIsland_i + \beta_5 Comlang_{ij} \qquad (2)$$

$$\beta_6 DPTA_{ij} + \beta_7 Comcol_{ij} + \beta_8 Colony_{ij} + \beta_9 Ter_j + \beta_{10} WAT_j + v_{ij}$$

where $dist_{ij}$is bilateral distance between trading partners, DCB_{ij} is dummy representing common border, $Dlandl_i$is dummy for exporting landlocked countries, $DIsland_i$ is dummy for exporting islands, $DPTA_{ij}$ represents dummy for preferential trade agreements, Ter_j represents the number of incidents of terrorism, $Colony_{ij}$, for pairs ever in colonial relationship, $Comcol_{ij}$ for common colonizer post-1945 and $Comlang_{ij}$ for common official primary language, ln stands for logarithm and v_{ij} are error terms. Manipulating equation (1) and substituting for $\ln\tau_{ij}$ yields

$$\ln x_{ij} = \gamma_0 + \gamma_1 lnY_i + \gamma_2 lnY_j + \gamma_3 \ln dist_{ij} + \gamma_4 DCB_{ij} + \gamma_5 Dlandl_i \ \gamma_6 WAT_j + \gamma_7 DPTA_{ij} + \gamma_8 DIsland_i + \gamma_9 Ter_j + \gamma_{10} Comlang_{ij} + \gamma_{11} Comcol_{ij} + \gamma_{12} Colony_{ij} + \varepsilon_{iay} \quad (3)$$

The equation is estimated using Fixed and Random Effects technique.

Data

The trade data are obtained from the United Nations database, covering trade flows from 1990 to 2013. Table 1 presents the countries included in the analysis. Gross Domestic Product (GDP) data of selected countries in US dollars is obtained from World Bank's World Development Indicators. US GDP deflator is used to convert nominal GDP to real. Terrorism data i.e., the number of terrorist activities and incidents are derived from Global Terrorism Database (GTD). GTD provides comprehensive information about domestic , transnational and international terrorism. Other gravity variables' data required in the trade model like geographical distance between the two countries, common border, common language, landlocked are acquired from French Research Center in International Economics (CEPII).

Table: 1. List of countries

Name of Country	Number	Percent
Argentina	1996	2.1
Austria	2152	2.2
Belgium	1680	1.8
Bangladesh	1821	1.9

Brazil	2159	2.3
Canada	2365	2.5
Switzerland	2345	2.4
CHL	1868	1.9
China	2308	2.4
CIV	1671	1.7
Columbia	1922	2.0
Cuba	1630	1.7
DEU	2391	2.5
Chile	1153	1.2
Denmark	2294	2.4
Algeria	1563	1.6
Egypt	2035	2.1
Span	2353	2.5
France	2412	2.5
Great Brittan	2417	2.5
Guatemala	1610	1.7
Hungary	1905	2.0
Indonesia	2063	2.2
India	2276	2.4
Italy	2376	2.5
Jordan	1752	1.8
Japan	2388	2.5
Kenya	1841	1.9

Korea	2196	2.3
Lebanon	1910	2.0
Mexico	2074	2.2
Malaysia	2139	2.2
Nigeria	1879	2.0
Pakistan	2012	2.1
Peru	1779	1.9
Philippines	1964	2.0
Poland	2110	2.2
Portugal	2189	2.3
Romania	1920	2.0
Senegal	1621	1.7
El Salvador	1428	1.5
Sweden	2262	2.4
Thailand.	2164	2.3
Turkey	2107	2.2
USA	2427	2.5
Venezuela	1780	1.9
Viet Nam	1908	2.0
Yamen	1259	1.3
Total	95874	100

Results and Discussion

Both random and fixed effects models are estimated to investigate the effect of number of terrorism incidents on imports and exports. Fixed-effects (FE) models are utilised to study the impact of variables that vary over time. Exogenous

variables such as political system of a country, business practices of a company, business cycles etc are fixed within a country and vary across countries. FE models controle for the effect of factors, fixed over time so that the effect of the exogenious varibales on bilateral trade could be estimated. However, parameters estimated using fixed effect models carry have high standard errors. These models also assume correlation between error term and exogenious variables. These perform well for data having high within-cluster variation or when variables change rappidly over time. Random effects (RE) model on the other hand assumes that unobserved variables are not associated with the exogenious variables. This assumption may be violated, however the model has lower standard errors and also allow estimating effects for time-fixed variables. Hence, this makes RE model more appropaite.

Trade flows are distinguished between developing- (i.e. South-South), developed-(i.e. North-North) and developed and developing (i.e. North-South) countries. Separate models are estimated for each group of countries considering both imports and exports using FE and RE techniques and results are compiled in tables 2 and 3.

Table: 2. Fixed Effect Estimates of the Effects of Terrorism Incidents on Imports and Exports

Variable	Imports			Exports		
	South-South	North-North	North-South	South-South	North-North	North-South
PTA	0.552**	0.122	0.062	0.429**	0.122	0.062
	(0.176)	(0.122)	(0.126)	(0.195)	(0.122)	(0.126)
Number of Incidents	0.0002	-0.0001	-0.0002	0.0001	-0.0001	0.0002
	0.0001	(0.0003)	(0.0001)	(0.0000)	(0.0003)	(0.0001)
GDP of Importing Country	1.1609	1.063***	1.124***	1.147***	1.063***	1.124***
	0.0153	(0.035)	(0.016)	(0.012)	(0.036)	(0.016)
GDP of Exporting Country	0.000	0.000	0.000***	-0.000***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	16698	3566	16249	16698	3566	16249
R-Squared	0.544	0.630	0.583	0.404	0.630	0.583
F-Statistics	1953.9***	977.1***		3164.5***	977.1***	2535.0***
Sigma U	2.372	2.758	2.531	2.884	2.759	2.531
Sigma e	0.8956	0.807	0.859	0.909	0.807	0.859
Rho	0.875	0.921	0.897	0.910	0.921	0.897

*Variables are statistically significant at *0.1, **0.05 and ***0.001 levels. Figures in parantheses show robust standard errors.*

Table 3. Random Effect Estimates of the Effects of Terrorism Incidents on Imports and Exports

Variable	Imports			Exports		
	South-South	North-North	North-South	South-South	North-North	North-South
Distance	-0.795***	-1.127***	-0.941***	-0.892***	-1.127***	-0.941***
	(0.077)	(0.179)	(0.083)	(0.106)	(0.179)	(0.083)
Common Border	1.253***	1.538***	1.291***	1.318***	1.538***	1.291***
	(0.283)	(0.354)	(0.208)	(0.37)	(0.354)	(0.208)
PTA	0.278**	-0.088	0.043	0.249**	-0.088	0.043
	(0.088)	(0.074)	(0.073)	(0.085)	(0.074)	(0.073)
Colony	1.032***	1.306*	0.893***	1.07***	1.306*	0.893***
	(0.195)	(0.777)	(0.258)	(0.275)	(0.777)	(0.258)
Comcol	-0.425	1.158	0.225	-0.556	1.158	0.225
	(0.422)	(1.451)	(0.518)	(0.801)	1.451	0.518
Common Language	0.286	0.241	0.089	0.393	0.241	0.089
	(0.188)	(0.593)	(0.237)	(0.246)	0.593	0.237
WAT	0.416***	1.431***	0.856***	0.424***	1.431***	0.856***
	(0.099)	(0.265)	(0.108)	(0.130)	(0.265)	(0.108)
Number of Incidents	0.0002	0.0001	-0.0002**	0.000	0.000	-0.0002**
	(0.000)	(0.0002)	0.000	(0.000)	(0.000)	(0.000)
GDP of Importing Country	1.162***	1.055***	1.118	1.143***	1.055***	1.118***
	(0.008)	(0.019)	0.008	0.007	(0.019)	(0.008)
GDP of Exporting	0.000***	0.000	0.000	0.000***	0.000	0.000***

Country	(0.000)	(0.000)	0.000	(0.000)	(0.000)	(0.000)
Number of observations	16698	3566	16249	16698	3566	16249
R-Squared	0.604	0.755	0.676	0.476	0.755	0.6763
Chi-Squae	26708.0***	8225.3***	25968.7***	28993.4***	822.3***	25968.7***
Sigma U	1.973	1.894	1.975	2.451	1.894	1.975
Sigma e	0.896	0.807	0.859	0.909	0.807	0.859
Rho	0.829	0.846	0.841	0.879	0.846	0.841

*Variables are statistically significant at *0.1, **0.05 and ***0.001 levels. Figures in parantheses show robust standard errors.*

The models have very good explantory power as R-squared ranges from 40.4 % for South-South model to 63 % for North-North model estimated using fixed effect technique in the case of exports. In the case of RE estimates, the overall explanatory power of the estimated models range from 47.6 % for South-South to 75.5 % for North-North model in the case of exports. The models are statistically significant. Estimates of rho range from 87.8 % for South-South imports to 92.1 for North-North imports and exports indicating that 87.8 and 92.1 %s of the variance is due to differences across panels for these models. The effect of distance on trade is negative and statistcially significant and close to unity. Similarly, countries with a common border, PTA, colonial relationships, common colonizer and common language trade more. The results show that all the variables have the expected effect on trade when statistically significant however, common colonizer is statistically insignificant for all the models estimated using RE.

The model specifically included two variables to captures phenomeon regarding war against terrorism. These include countries being partners in war against terrorism. These include NATO and three non-nato countries included in the data set used in the analysis. NATO comprises of 28 countries out of which 12 (Belgium, Canada, Denmark, France, Germany, Hungary, Poland, Portugal, Spain, Turkey, United Kingdom and USA) are included in the data set used in the analysis. They are partnered by three developing countries, Pakistan, Yemen and Iraq, and the first two are included in the data set. Random effect model shows that being a member of NATO or their partner, has a positive and statistically significant effect on both imports and exports. The implication is that these countries support each other in trade and provide each other concessional access to their markets. However, further analysis is required to specifically identify these concessions. The effect of terrorism incidents on trade has been statisticaly insignificant when South-South and North-North trade with each other. However, this effect, estimated using RE technique becomes negative and statistically

significant for both exports and imports when North-South trade with each other. Since security measures are more stringent in developed countries, therefore, developing countries find it dificult to trade with developed countries. Further analysis is needed to further explore these results and identify the regions which has negatively been affected by war against terrorism.

Conclusion

This is an on-going study to estimate the effect of terrorism incidents on trade using gravity model. The study uses annual bilateral trade data come from the United Nations Comtrade database, covering trade flows from 1990 to 2013. The data set consists of 50 countries including six lower income countries, 17 Lower Middle Income countries, 13 Upper-Middle Income countries and 14 High income countries include. Countries are grouped as South-South when developing countries trade with each other, North-North when developed countries trade with each other and North-South when developed and developing countries are trade partners. The analysis shows that all the standard gravity-type variables carry expected sign. Further countries partner in war against terrorism have statistically significantly higher trade than those not partner in the trade. Also, the number of terrorism incidents have negative effected both exports and imports when developing countries trade with developed countries.

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