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TAXING IMPACT OF TERRORISM ON GLOBAL ECONOMIC OPENNESS OF DEVELOPED AND DEVELOPING COUNTRIES

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This study examines the relationship between terrorism and economic openness that takes into account both the number and intensity of terrorist incidents and the impact of government military expenditures on trade-GDP and foreign direct investment-GDP ratios for both developed and developing countries. It uses the dynamic GMM method to account for endogeneity in the variables. Deaths caused by terrorism have a significant negative impact on FDI flows, and the number of terrorist attacks is also found to be significant in hampering the countries' ability to trade with other nations. The study also demonstrates that the developing countries exhibit almost similar results to our main analysis. The developed countries exhibit a negative impact of terrorism, but the regression results are not significant.

Keywords: FDI, terrorism, military spending, developed and developing countries

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1. INTRODUCTION

Terrorism is an unlawful and premeditated use of violence, intimidation of civilians, obliteration of property, disruption of economic activities and penalization of political regimes committed by individuals, groups and/or governments in the pursuit of political aims that may spread over borders (Oxforddictionaries.com, 2016). It strikes certain geographical locations, specific industries such as tourism, flows of foreign investments and routes of international trade. It can be enormously costly in terms of causing civilian casualty and property damage, disrupting cross-border trade, impairing globalization, creating mounting political and economic uncertainty and heightening a sense of fear and insecurity. Terrorism can skew the trade/GDP ratio out of its favour, deter current and potential foreign direct investments (FDI) and throw tariffs off balance. The impact of these factors individually or in combination could be severe on a country's economy and global trade.

Over the past decade, terrorism has become one of the most predominant problems around the world and an obstacle to economic growth. Although the motives of terrorists may differ from one region to another, the acts committed, such as bombings, suicide bombings, kidnappings, assassinations and airplane hijackings are methods employed by the terrorists to pressure governments to give in to their demands and ambitions. Thus, the repercussions of these acts have a variety of impacts on the countries against which these acts are committed. The New York terrorist attack in 2001 has significantly affected the United States' and the world's economies and caused wars among nations. Thus, the economic costs to the affected country are not limited to the costs that are directly related to this event but also to other factors in other ways. The impact of these factors individually or in combination could be severe to a country's economy and economic openness. Terrorism can affect economic openness through three channels. First, it creates a case of insecurity and forces governments and businesses to take counter measures that increase the cost of economic activities. Second, firms find the country affected by terrorism less attractive and look elsewhere for opportunities. Third, there is a high risk that terrorism severely damages or captures traded goods and investments.

The motivation behind working on this study is to show that certain damages caused by terrorism can be empirically measured and in particular to examine the consequences of terrorist attacks on the openness of the global economy including international trade and FDI. Not only does terrorism influence the economic activity of a country, but also it has repercussions which can be seen in the development of global society. The results of this research paper will bring into view one of the more overlooked consequences of terrorism which affect cross-border

trade and international flows of capital. When brought into view, those results will be helpful to politicians, governments and policy-makers as they will underscore the importance of combating terrorism to promote the exchange of goods and services across nations and fostering international flows of capital.

To our knowledge, there have not been recent studies on the relationship between terrorism and economic openness that take into account both the number and intensity of terrorist incidents and the impact of government military expenditures on trade volume and FDI for both developed and developing countries as we have in this study. Additionally, most of the current literature with a few exceptions has research that was conducted in the 1980s to 1990s. Since that research was conducted, terrorist attacks have become more prominent and widespread in the world. They have increased in frequency as well as in scale in which they are carried out. So this study contributes and examines the issue by using more recent and larger number of observations. The sample drawn from multiple countries makes its scope more global and reliable. Further, it shows the impact of terrorism on trade and FDI across the sample of developed and developing countries.

The purpose of this study is to discern the impact of terrorism on global economic openness, which is measured by the trade/GDP and FDI/GDP ratios, using panel data models. More specifically, this impact is investigated for the cohorts of developed and developing countries to ascertain whether their trade and investment are shaped differently by the terrorist incidents. Terrorism is measured as the number of people killed or injured as a result of terrorist attacks in any given country at any given year. The panel for the trade/GDP ratio contains data for 118 developed and developing countries, while the panel for FDI/GDP ratio contains observations for 127 countries. The difference in the cross-sectional observations of the two data sets is due to the unavailability of data on the dependent variables. In order to mitigate the reverse causality, we use the one-year lag for conducting the GMM regressions. The data sources for this study include the World Bank Data Bank, the Global Terrorism Database and the United Nations Refugee Agency (UNHCR). However, due to the nature of the dataset where the N cross-section units are far greater than the T years, the conventional panel data models including fixed effects or random effects will create biased estimations.

We employ a panel estimation method that controls for the country-specific and time-specific unobserved heterogeneity. Further, we quantify the impact of government's military expenditures on trade and investment volumes because government's ability to spend to control terrorism campaigns (as defensive actions to harden targets and proactive measures to capture terrorists) may signal an encouraging sign to foreign investors. In other words, government's military

expenditures exert a contrasting effect on trade, compared to terrorist attacks. In additional analysis, we separate the developed and developing economies and re-examine the impact of terrorism on trade and investment volume for the two cohorts.

Finally, we quantify the influence of terrorism on trade flows by applying the generalised method of moments (GMM) models. GMM is considered to be superior to other panel econometric techniques, such as the two-stage least square (2SLS) and the fixed-effects regressions (Cermeno et al. 2006). First, the first difference in GMM removes the effects of time-invariant data on the coefficients' estimates. Second, in contrast to the 2SLS regression, which addresses the issue of endogeneity but has a problem to choose the instruments (Arellano – Bond 1991), the GMM uses the lagged values of original regressors as instruments to the explanatory variables. Considering our model has a lagged dependent variable, which makes the model dynamic, the GMM technique is the most appropriate one.

For our case, by using the GMM method, we can build instruments for those explanatory variables (military expenditures and terrorist attacks as explained earlier) that are potentially endogenous. Furthermore, according to Winooski et al. (2012), the fixed-effects estimation assumes that the current observations of the explanatory variable (in our case the military expenditures) are completely independent of the past values of the dependent variable. However, this assumption fails to address the dynamic endogeneity. The GMM method controls for both sources of endogeneity including unobservable heterogeneity and dynamic endogeneity. Finally, this methodology provides controls for the correlation of errors over time, the heteroskedasticity among units and the simultaneity and measurement errors caused by the use of orthogonal conditions of the variance matrix. Thus, the best way to deal with endogeneity is to use the instrumental estimation techniques.

The major result of this study shows a negative effect of both terrorist attacks and terrorist killings on the FDI/GDP and trade/GDP ratios. Further, government military expenditures as a counter solution to terrorism also exert a negative impact on the FDI/GDP and trade/GDP ratios. It means that the growing military expenditures can be an alarming situation for investors as increasing incidents of terrorism negatively influence trade openness. In addition to this, the study also finds a negative relationship between the numbers of injured, as a measure of terrorism and FDI.

The remainder of this paper is structured as follows. Section 2 reviews the relevant literature. Section 3 presents theoretical framework. Section 4 presents the dataset and the estimation technique. Section 5 discusses the empirical results and Section 6 concludes the study.

2. LITERATURE REVIEW

A number of works have investigated the correlation between terrorism and its effect on FDI, trade ratio, tariffs and stock markets, etc. For example, Nitsch – Schumacher (2003) investigate the effect of terrorism on bilateral *trade flows* between 200 countries for the period from 1960 to 1993. They find a negative relationship between terrorist activities and the volume of trade. Importantly, they reveal three channels through which violence can hinder international trade. Similar to the work of Nitsch – Schumacher (2003), another study has been conducted by Blomberg – Hess (2004), discerning the empirical impact of violence on trade compared to the impacts of other trade impediments. Those authors argue that if a country is affected by terrorism and the government diverts its resources to quell or prevent such attacks, the resulting *deficit in the budget* could lead to stagnation in future trade and economic *growth potential* of the country. They test their contention using panel data for 177 countries during the period from 1968 to 1999. The results show that a terrorist incident is associated with a 7.6 percentage point decline in bilateral trade in the respective country. However, this effect is less than half as large as the negative impact on trade from external and inter-ethnic conflicts.

Bandyopadhyay et al. (2014) construct a theoretical model to examine the relationship between two major forms of terrorism and FDI. They analysed how these relationships are sensitive to *foreign aid* flow by using data for 78 countries over the period of 1984–2008. These authors find that both types of terrorism, domestic and transnational terrorisms depress *FDI,* however, incidents of transnational terrorism have a greater negative impact on FDI than domestic events. They also find that foreign aid mitigates negative effects of terrorism. Aggregate aid reduces negative consequences of both transnational and domestic terrorism, however, it has more robust effect for domestic terrorism. When aid is further subdivided into bilateral and multilateral aids, they report that bilateral aid is more effective for transnational terrorism and multilateral aid is effective in reducing the negative consequences of domestic terrorism.

Filler – Stanisic (2016) stated that terrorism events cause disruptions to the economies, which directly affect the risk related to investments. They basically examined how different types of inflows react to the terrorist incidents. In addition, they also analysed the spillover effect across the countries. They showed a decrease in capital inflows as a result of terrorism events and found a negative spillover from terrorism to FDI into the *neighboring countries* and that the cultural and not-geographical closeness matters more.

Enders – Sandler (1996) estimated the impact of terrorist incidents on FDI and reported that Spain and Greece suffered 12% and 13% fall in FDI due to terrorist

incidents, respectively. Mehmood (2014) reported that Pakistan faced an economic cost of about 1% of real GDP growth per year as a result of terrorism. By incorporating spillover effects of transnational terrorism and security on trade, De Sousa et al. (2010) used a trade model examining the relations between US bilateral net imports and terrorist incidents against US targets. In addition to the negative impact of terrorism on trade, the authors also established that terrorism caused negative spillover effects on the bilateral trade in economies which were closer to the regions where terrorist groups were based.

Drakos (2009) examined the impact of terrorism on the *stock markets* of 22 countries and showed that terrorist incidents negatively and significantly affected the daily stock returns of those markets.[1] This author also reported that the negative effect was exacerbated by psychosocial effects. Procasky – Ujah (2016) investigated the long term effect of terrorism on *financial markets.* Specifically, they considered sovereign risk which results in lower credit ratings and this effect was more sensitive for the developing countries as compared to the developed ones. Their results show that the *sovereign debt ratings* are negatively influenced by terrorist incidents but provide no evidence of whether greater returns associated with lower ratings are sufficient to offset the effects of terrorism on the total foreign debt finance.

In most of the previous studies, the number of terrorist incidents per year is used as a proxy for terrorism; however, the major problem with this measure is that it ignores the intensity of terrorist attacks. The intensity of the attacks can be captured by a more suitable measure of terrorism which is the number of casualties of those killed and injured per year due to such incidents (Enders – Sandler 1996). Aslam – Kang (2015) examine the impact of terrorism on the financial markets and also report that the magnitude of the effect varies with respect to the type of attacks, the type of economies and the severity of attacks. These authors find that the greater the level of severity the larger the negative effect on the financial market returns. Eckstein – Tsiddon (2004) analyse the impact of terrorism on the Israeli economy by using the number of fatalities as a terrorism measure and find that despite similar death rates from terrorism and car accidents, the impact of terrorism is far more severe on the Israeli economy. Tavares (2004) also investigated the impact of terrorism on GDP growth by using the total number of attacks, broken down according to the targets, organizations and casualties and found that terrorism had a significant negative effect on GDP growth. Finally, Abadie – Gardeazabal (2003) also used casualties from terrorism as a measure

[1] Other studies that examine the impact of terrorism on stock markets include Carter ─ Simkins 2004; Chen ─ Siems 2004; Eldor ─ Melnick 2004; Gulley ─ Sultan 2006; Amélie ─ Darné 2006; Chesney ─ Reshetar 2007; Nikkinen et al. 2008 among others.

in the case study of Spain and found a significant gap in GDP per capita. *Table 1* provides the overview of these studies.

As indicated before, we use a more recent data for both number of terrorist killings and injured, investigate the impact of military expenditure on economic openness, distinguish between terrorist impacts on the developed and developing countries and use the GMM technique to address endogeneity.

3. THEORETICAL BACKGROUND

There are two main studies in the literature which provide theoretical models to study the impact of terrorism on economy.

The study by Eckstein – Tsiddon (2004) is one of the few theoretical studies which formally develops a model for examining the effect of terrorism on economy. It states that the variation in life expectancy due to terrorism negatively affects economy because of the reaction by individuals and government. Terrorism causes individuals to change their investment and consumption patterns, while governments start increasing the consumption of defence goods. The theory states that the rise in probability of casualties caused by terrorist attacks reduces investment level in the short run while production and consumption in the long run. Eckstein – Tsiddon (2004) basically extend the Blanchard and Yaari models (Yaari 1965; Blanchard 1985) by adding defense and terrorism expenditures in the model. Here, terrorism increases death rate in the model which was previously constant. This theory also suggests that government can control death rate by increasing defense expenditures.

Moreover, governments allocate a certain proportion of production on defence, due to which capital stock decreases but the chances of lesser discount rate increases due to the improved security conditions which ultimately lead to higher investments in the economy. Basically as terrorism increases, the perceived death rate also increases, which results in less consumer confidence and higher current consumption. Hence, a rational government buys security by forgoing capital stock to increase defense expenditures. Further, in the absence of defence expenditures, the discount rate increases and this reduces investments in the long run. In short, this theoretical notion is related to domestic strength of trade which leads us to develop our first hypothesis about trade ratio and terrorism.

Abadie – Gardeazabal (2008)'s theoretical model is also very important for an open economic setting. It theorizes that in the presence of terrorism, the output level in the economy is determined by its capital mobility. They state that international investors have many options to diversify their portfolios, so terrorism causes investors to move their investments to safer countries. Terrorism

negatively affects the rate of return on capital through two channels: first through the direct destruction of capital and secondly through the reduction in marginal productivity of capital. This model assumes perfect mobility, therefore investors look to diversify their risk by shifting their investments to the safe locations and this ultimately causes FDI to decrease in the economy. Hence, this theoretical stance helps us develop our second hypothesis related to terrorism and FDI-to-GDP ratio. On the basis of the above discussion, we propose our hypotheses as:

Hypothesis 1: There is a negative impact of terrorism on trade-to-GDP ratio
Hypothesis 2: There is a negative impact of terrorism on FDI-to-GDP ratio

4. DATA AND ESTIMATION TECHNIQUE

4.1. Data

We empirically examine the effect of terrorism activity[2] on global economic openness for many countries over a period of 10 years (2006–2015). The data sample is constrained by the data availability for all the included countries. A precise summary of variables description is given in *Table 2*. To measure the degree of economic openness for countries across the globe, we choose the trade-to-GDP ratio and the total FDI-to-GDP ratio as the dependent variables. As for the measurement of terrorism, we use both the number of people killed and injured as a result of terrorist attacks in any given country at any given year. At the same time, we believe a government's effort to contain and decrease the level of terrorism activity will be reflected in the country's military expenditures.

Looking at the trends of military expenditures, it is safe to assume that a high level of terrorism activity is one of the major driving forces behind increasing military expenditures (Council on Foreign Relations 2016). For this reason, we decide to include military expenditures as an independent variable in the regression analysis of how terrorism affects economic openness. It is important to mention that we exclude countries like Afghanistan and Iraq from the analysis by considering these as outliers for the regression, but the history of these countries' ongoing conflict can still help us interpret the impact of terrorism over the activity level of foreign capital. Due to the exceptional institutional instability (poor law and order situation), data for such countries is not available anyway. During 2016–2018

[2] Throughout this paper, we use the term terrorism, as national goverments do. We do not attempt to evaluate the political aims of groups, labelled as "terrorist".

years, the annual rate of casualty caused by terrorism in Afghanistan increased by 407%, while the percentage of total FDI flow to GDP decreased by 7%.

In the current research, we construct two parallel regressions – one has the trade/GDP ratio as the dependent variable, while the other has the total FDI flow/GDP as the dependent variable. Due to data unavailability, the data panel for each of the two regressions is similar yet has minor differences. *FDIR* represents the FDI-to-GDP ratio in this study. For this, we collect the total FDI inflows and outflows data from the World Bank Data Bank and the *FDIR* is calculated as the sum of total FDI inflows and outflows divided by GDP measured in the value of the 2005 USD. Similarly, *TR* is the acronym for the trade/GDP ratio. This trade ratio is the sum of exports and imports of goods and services as a share of GDP. It measures individual country's activeness in global trade and is generally a wide adopted measurement of economic openness. *FDIR* and *TR* are the two ratios we use as the dependent variables in our regression analysis.

MER represents the military expenditures-to-GDP ratio in this study. It is calculated as the total military expenditures divided by the country's GDP. As discussed above, a high level of terrorism activity is likely to result in an increase in military expenditures because of the increasing costs in counterterrorism operations. Thus, we will examine the effect of increasing military expenditures on economic openness – in another words, investors will be discouraged if the target country's military expenditures appear to be aggressive.

Overall, the two panels are strongly balanced as there are no missing observations for any country at any period. The original dataset contained a period of 10 years, while the actual panel has only 9 years because of the lag in the dependent variable. For regressions we decide to use logarithmic scale of our dependent variables, which are the FDI and trade ratios, as well as *MER*. Moreover, we exclude four outliers as suggested by previous studies including Afghanistan, Iraq, Palestine and Western Gaza owing to unavailability of data. Due to the nature of our dataset, we take log for part of the variables, such as the FDI ratio, the trade ratio and the military expenditures ratio for data smoothening. These logged variables are represented by *LFDIR*, *LTR* and *LMER*, respectively. *NTK* and *NTI* represent respectively the total number of people killed and injured per 1,000,000 population that are directly related to terrorist attacks.

The Global Terrorism Database is a comprehensive data collection of all recorded terrorist incidents of any scale from 1970s to the current date. By utilizing this database, we are able to summarize the data and extract the information we need for the *NTK* and *NTI* variables. This database also contains the number of total terrorist incidents, which is presented in our panel as the number of terrorist attacks per 1,000,000 population (NTA). *RPP* stands for the refugee population as a percentage of country's total population. We collected information of refugee

population from the United Nations Refugee Agency (UNHCR) and calculated the refugee population as the percentage of the population data from the World Bank Data Bank accordingly.

4.2. Estimation technique

Considering the nature of the data set used in this research, which has a '*n*' of either 118 or 127 countries and a '*T*' of only 10 periods, the use of conventional fixed effects (FE) or random effects (RE) models may create biased estimation. As a result, we use the dynamic generalized method of moments (GMM) model in estimating the impact of terrorism activities on global economic openness for the countries under consideration. Both regressions include lagged dependent variables (the FDI ratio or the trade ratio) as the regressors along with terrorism activities. The lags of explanatory variables are used as instruments in the estimation process. That is,

$$LFDIR_{it} = \alpha_1 + \alpha_2 LFDIRLAG_{it} + \alpha_3 LMER_{it} + \alpha_4 NTA_{it}, \quad (1)$$

$$LTR_{it} = \alpha_1 + \alpha_2 LTRLAG_{it} + \alpha_3 LMER_{it} + \alpha_4 NTA_{it}. \quad (2)$$

In Eq. (1), *FDIR* refers to the FDI flow as a percentage of the country's total GDP, and *LMER* is the log level of a country's military expenditures as a portion of GDP. *NTA* represents the total number of terrorist attacks. In Eq. (2), *TR* refers to the trade ratio, while *TRLAG* is the one period lag of the logged *TR*, while *NTA* captures the total number of terrorist attacks. It is expected to observe a positive and statistically significant sign for LMER and negative and statistically significant sign for NTA in our results. The justification of using the variables specified above as well as a detailed summary of those variables is included in the data description and summary statistics subsection.

5. EMPIRICAL RESULTS

5.1. Descriptive statistics

Tables 3 and *4* both show the statistical summary of the data sets for the regression over FDI flow and trade ratios. The total cross-section countries for FDI flow is 127 while the number of countries included for the trade ratio analysis is 118, the difference of 9 countries is due to data unavailability. Therefore, we

have total 1270 observations for the *FDIR* panel and 1173 observations for the *TR* panel, but as mentioned earlier the regression method we have chosen includes one period of lag length, which means that the actual dataset is reduced by 1 year. *Table 3* shows that the average number of attacks, the average number of killings and the average number of the injured in the *FDIR* panel are 0.52, 0.61 and 1.33, respectively. Similarly, these values in the *TR* panel are 0.55, 0.58 and 1.28, respectively. It can be seen that the mean and median of *LFDIR* are 1.16 and 1.10, respectively, which are very close, and this similarity indicates a normal distribution of this dependent variable. Similarly, the mean and median of *LTR* are 1.91 and 1.92, respectively, which are again very close, and also show the normality of this dependent variable.

5.2. Unit Root Tests

This study uses four well-known unit root tests to examine the stationarity of the three terrorism variables, *NTK*, *NTA* and *NTI*. These tests include the Levin-Lin-Chu test, the Im-Pesaran-Shin test, the Augmented Dickey Fuller test and the PP-Fisher test. All these four tests suggest that there are no unit roots observed in these concerned independent variables. *Table 5* shows the unit root results, where the probabilities are less than the 5% significance level, which shows a rejection of the null hypothesis that the variables listed above have unit roots. Therefore, it indicates that these variables are stationary. Only the Im-Pesaran-Shin test indicates a probability for *NTI* that is greater than 5%, but the other tests' probabilities for this explanatory variable remain less than 5%, which confirms stationarity of *NTI* at the level. Therefore, it is legitimate to use the level of these variables in the panel data analysis. The study also examines stationarity of both dependent variables, *FDIR* and *TR*. According to the results of all four tests, both dependent variables are also found stationary at the level.

5.3. Multivariate regressions

Table 6 shows the results of the dynamic *GMM* for the *FDIR* and *TR* panels. The first column shows the results for Eq. (1), that is, for the FDIR panel, showing that all the independent variables are significantly related to *FDIR*. Specifically, *NTA* and *LMER* are statistically significant at the 10% level, while *LFDIRLAG* is statistically significant at the 1% level. The results also show that both *LMER* and *NTA* have significant negative effects on *FDIR,* while *LFDIRLAG* has a significant positive effect. The probability of the *J*-statistics (test of over-identifying

restrictions) is 0.19, indicating that we cannot reject the null hypothesis that there is no correlation between the instrument and the error term.

As shown in *Table 6,* a country's military expenditure is expected to have a negative impact on its ability to make a continuous flow of cross-border capital. Since *FDIR* is calculated as the total *FDI* inflows plus outflows divided by GDP, both the destination and the origin country of *FDI* is tested to be vulnerable to terrorism according to the regression results. The empirical result that increasing the military expenditure ratio is likely to cause a decrease in the total *FDI* flow is unsurprising. The driving force behind increasing the level of military activity will hamper investments and foreign operations in most cases. As the coefficient of *LMER* suggests, roughly a 1% increase in the country's military expenditure-GDP ratio will result in a 0.12% decrease in the total FDI flows. For smaller countries requiring *FDI* inflows to help them develop their domestic economy, the negative impact could be more detrimental to their economic growth considering the smaller size of their economy. In our regression model, the coefficient for *NTA* is –0.042, which confirms our findings about terrorism's negative impact on the level of foreign capital activities in a country.

The second column of *Table 6* shows the regression results for the equation of trade/GDP ratio panel. The result shows that both *NTA* and *LMER* have significant negative effects on *LTR,* while *LTRLAG* has a significant positive effect on *LTR*. The coefficients of *NTA* and LMER are statistically significant at the 5% level. The probability of the J-statistics is again greater than 0.05, which proves that there is no correlation between the instrument and the error term. As suggested by the results, if the number of terrorist attacks in a given country increases, the cross-border trade activity will receive a negative shock. However, the degree of the impact is not very high, but the loss in global trade caused by terrorism activities is not negligible.

5.4. Robustness tests

This study also formulates robustness regression equations to confirm its regression results of Eqs. (1) and (2). It basically redesigns Eq. (1) and (2) by replacing *NTA with NTK* and *NTI* as alternative proxies of terrorism, respectively.

$$LFDIR_{it} = \alpha_1 + \alpha_2 LFDIRlag_{it} + \alpha_3 LMER_{it} + \alpha_4 NTK_{it} \tag{3}$$

$$LFDIR_{it} = \alpha_1 + \alpha_2 LFDIRlag_{it} + \alpha_3 LMER_{it} + \alpha_4 NTI_{it} \tag{4}$$

$$LTR_{it} = \alpha_1 + \alpha_2 LTRlag_{it} + \alpha_3 LMER_{it} + \alpha_4 NTK_{it} \tag{5}$$

$$LTR_{it} = \alpha_1 + \alpha_2 LTRlag_{it} + \alpha_3 LMER_{it} + \alpha_4 NTI_{it} \quad (6)$$

Table 7 displays the results of the robust equations. It can be seen that the robustness results verify our major findings. From the above equations, *NTK* and *NTI* are found to have significant negative effects on the FDIs and trade to GDP ratios, while *LFDIRLAG*, *LTRLAG* are again found to have significant positive effects. Results also verify the negative and significant effect of *LMER* on trade openness in all equations except for Eq. (3), where the coefficient is positive but insignificant.

5.5. Additional analysis: separation of developing and developed countries

In addition, this study also examines the impact of terrorism on trade considering the different economic development levels of the countries. With this objective in our mind we re-estimated our models. The earlier GMM estimation technique for the countries as one group is reused for both the developed and developing samples separately. This additional analysis in *Table 8* clearly demonstrates that the developing countries exhibit almost similar results to our main analysis, that is, terrorism has a significant negative impact on both *LFDIR* and *LTR*. In the case of developed countries the results do exhibit a negative impact of terrorism on both *LFDIR* and *LTR,* but these impacts are not significant in the majority of Eq. structures. We can conclude from these results that stronger economic or development conditions may mitigate the impact of terrorism on economic openness or this can be seen in the way that the developed economies usually are stronger and have the potential and the means to absorb the impact of terrorism, whereas the developing countries face more severe consequences of terrorism and are less able to deal with them. We may also conclude that the origins of most terrorist attacks have to do with the countries at lower levels of economic development that happen to suffer from cultural, ethnic and religious conflicts. Finally, it is possible that as De Sousa et al. (2010) argue, terrorism causes negative spillover effects on the bilateral trade in economies which are closer to regions where the terrorist groups are based.

6. CONCLUSION

Terrorism is developing into a great threat to the world's economy and people's wellbeing. We have long known that terrorism is detrimental to economic openness, yet we hardly know how. Through this study, we unveil the degree of how terrorism hampers economic connectivity through international trade and FDI

in the world. We succeeded in distinguishing between the impact of terrorism on economic openness for both the developed and developing markets. We also managed to examine the impact of government military spending as a counter measure to terrorism.

Our study examines the impact of terrorism measured by the level of military expenditure and the number of terrorist attacks and casualties on global economic openness for the 118/127 developed, developing and underdeveloped countries over the period of 2006–2015. The economic openness is measured both by the trade/GDP ratio and the total FDI flow-to-GDP ratio. Using the dynamic GMM method, the two models based on trade and FDI give us economically intuitive results and show consistency in those results. As we conclude, increasing the level of military expenditures generally serves as an alert to multinational companies and investors since these rising expenditures highlight the existence of conflicts. In this case, smaller states might find the impact to be more detrimental on their external balances since the loss in capital flows hurts smaller economies more.

Deaths and injuries caused by terrorism also have significant negative impacts on the FDI flows, and the number of terrorist attacks is also found to be significant in hampering countries' ability to trade with other nations. However, these effects are weaker in developed economies as compared to developing ones.

Based on the empirical findings, this study implicates that authorities must focus on policies relating to terrorism in order to enhance the macroeconomic conditions. Results prove that the terrorism activities cause both foreign investments and trade to deteriorate. Similarly, authorities must also use counter expenditures carefully because it also convey negative signals to the foreign investors. It is important to mention the caveats in our study. One should note that our examination has focused only on the relation between terrorism and trade. We caution about generalising our results to other aspects of terrorism. Future work could focus on the effects of internal conflicts, political instability, and the role of bilateral trade agreements to fully comprehend the effect of terrorism on trade. Future research should also examine how terrorism affects the currency exchange rate which could thwart the trade flow. We hoped to address further issues, e.g. how the role of the U.N. peace keepers might help economies to regain their economic openness but we failed to do so in this paper because of data inaccuracy and unavailability.

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Table 1. Literature review summary

Author	Objective	Dependent Variable	Independent Variables	Method	Key Findings
Filler – Stanisic (2016)	To examine how different types of capital inflows react to terrorist incidents.	FDI Equity Portfolio Investment Lending (Debt)	Terrorist Incidents	Fixed effects (FE) and random effects (RE) models.	Find evidence that FDI flows are more sensitive to terrorism than either portfolio investments or external debt flows.
Procasky – Ujah (2016)	To examine long term impact of terrorism on financial markets.	Sovereign Credit Ratings	Global Terrorism Index; Log of GDP Per Capita (Current US$); Inflation deflated by GDP deflator (Annual %); GDP Per Capita Growth (Annual %); Total Reserve to GDP Per Capita; Log of Export of Good and Services; Control of Corruption; Political Stability	Ordinary least square estimations.	Find that terrorism results in a higher cost of debt for sovereigns and by extension, firms in impacted countries.
Aslam – Kang (2015)	To examine the impact of terrorism on financial markets.	Daily stock market returns	Location; Types of Attacks; Number of People killed in attacks; Index for violence	Event study methodology.	Find that terrorist attacks have adverse effect on the performance of Karachi stock market. The magnitude of the effect varies with respect to the type of attacks, the type of economies and the severity of attacks.
Bandyoppdhyyay et al. (2014)	To investigate the relationship between the two major forms of terrorism and FDI.	Percentage of Net FDI inflows to GDP	Domestic Terrorism; Transnational Terrorism; Aggregate aid/GDP; GDP growth rate; Trade/GDP; Ln(Inflation); Investment Portfolio	Feasible generalized least square estimation technique.	Both types of terrorism are found to depress FDI. International aid mitigates the negative consequences of domestic and transnational terrorism.

Table 1. cont.

Author	Objective	Dependent Variable	Independent Variables	Method	Key Findings
Mehmood (2014)	To study the relationship between terrorism and macro-economy.	GDP; Investment	Terrorism index; FDI; Interest Rate; Government Expenditure	Quasi-Structural VAR, VECM, Impulse Response Functions and Granger-Causality tests are employed to study the relationship between terrorism and macro-economy.	Finds that cumulatively terrorism has cost Pakistan 33.02 % of its national income.
De Sousa et al. (2010)	To study the impact of transnational terrorism diffusion on security and trade.	Ln(Industry Exports) from exporter to destination Ln(Business Visas) from the US to exporter	Terror Incidents Exporter's terror against destination; Exporter's terror against all destinations; Regional Trade Agreement; Currency Union; Ln (Distance); Common Language; Common Land Border	Based on a simple theoretical a model, ordinary least square estimation technique is used.	Find (1) a direct negative impact of transnational terrorism on trade; (2) an indirect negative impact emanating from terrorism of neighbouring countries; and (3) that trade is increasing with remoteness to terror.
Drakos (2009)	To explore the impact of terrorism on daily stock market returns.	Stock market daily closing prices	Terrorist incidents	Flexible versions of the World CAPM allowing for autoregressive conditional heteroscedasticity.	Terrorist activity leads to significantly lower returns on the day of terrorist attack occurrence.

Table 1. cont.

Author	Objective	Dependent Variable	Independent Variables	Method	Key Findings
Tavares (2004)	To answer three different questions: what are the determinants of terrorism; is there an output cost following a terrorist attack; and is that cost larger or smaller in the case of democracies?	Terrorist attacks	GDP per capita GDP growth Political rights	Ordinary least square estimation.	Rich countries are most prone to suffer attacks while democracies are, if anything, less vulnerable than other countries.
Abadie – Gardeazabal (2003)	To examine the economic effects of conflict, using the terrorist conflict in the Basque Country as a case study.	Real per capita GDP	Terrorism activity	Event study methodology and portfolio regressions.	After the outbreak of terrorism in the late 1960's, per capita GDP in the Basque Country declined about 10 percentage points relative to a synthetic control region without terrorism.
Blomberg – Hess (2004)	To examine the empirical effect of violence, as compared to other trade impediments, on trade flows.	Bilateral trade [(exports+imports)/ GDP]	GDP; population; distance; common language dummy; colonial dummy; same currency dummy; boarder sharing dummy; regional sharing dummy; violence; and tariff	Ordinary least square estimation.	Conflict has strong effect on trade.

Table 2. Description of variables (with variable names)

Variables	Acronym	Definition
Dependent variables		
Trade ratio (trade/GDP ratio)	TR	Sum of exports and imports of goods and services as a share of gross domestic product.
Foreign direct investment ratio (FDI/GDP ratio)	FDIR	Sum of total FDI inflows and outflows over GDP measured at constant 2005 USD.
Independent variables		
Military expenditures ratio	MER	Total military expenditures divided by the country's GDP.
Number of terrorist attacks	NTA	Total number of terrorist events per 1,000,000 population
Number of people killed in terrorist attacks	NTK	Total number of people killed per 1,000,000 population
Number of people injured in terrorist attacks	NTI	Total number of people injured per 1,000,000 population

Table 3. Descriptive statistics for the FDIR panel

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
LFDIR	1.16	1.10	2.98	–0.08	0.25	1270
LFDIRLAG	1.16	1.10	2.98	0.90	0.24	1270
LMER	1.92	1.47	16.16	0.00	1.62	1270
NTA	0.52	0.00	44.87	0.00	2.64	1270
NTK	0.61	0.00	50.96	0.00	3.35	1270
NTI	1.33	0.00	233.23	0.00	9.02	1270

Notes: LFDIR refers to the log value of FDI flow as a percentage of the country's total gross domestic product, and LFDIRLAG refers to the one year lag values of LFDIR. LMER is the log level of a country's military expenditures as a portion of GDP. NTA captures the total number of terrorist attacks. NTK and NTI represent the number of people either killed or injured because of terrorism activities, respectively.

Table 4. Descriptive statistics for the TR panel

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
LTR	1.91	1.92	2.64	1.33	0.21	1173
LTRLAG	1.91	1.92	2.64	1.34	0.21	1173
LMER	1.96	1.50	16.16	0.00	1.65	1173
NTA	0.55	0.00	44.87	0.00	2.73	1173
NTK	0.58	0.00	43.80	0.00	3.05	1173
NTI	1.28	0.00	233.23	0.00	9.01	1173

Notes: LTR refers to the log value of trade ratio and LTRLAG refers to the one year lag values of LTR. LMER is the log level of a country's military expenditures as a portion of GDP. NTA captures the total number of terrorist attacks. NTK and NTI represent the number of people either killed or injured because of terrorism activities, respectively.

Table 5a. Unit root tests for independent variables

Number of attacks

Method	Statistic	Prob.**	Cross-sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	–16.6714	0.0000	75	600
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	–5.55101	0.0000	75	600
Augmented Dickey Fuller - Fisher Chi-square	272.061	0.0000	75	600
PP - Fisher Chi-square	371.766	0.0000	75	675

Number of killings

Method	Statistic	Prob.**	Sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	–5.29400	0.0000	49	392
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	–1.77508	0.0379	49	392
Augmented Dickey Fuller - Fisher Chi-square	142.217	0.0024	49	392
PP - Fisher Chi-square	285.837	0.0000	49	441

Number of injuries

Method	Statistic	Prob.**	Sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	–2.22099	0.0132	58	464
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	–0.75064	0.2264	58	464
Augmented Dickey Fuller - Fisher Chi-square	167.986	0.0012	58	464
PP - Fisher Chi-square	293.190	0.0000	58	522

Table 5b. Unit root tests for dependent variables

Foreign Direct Investment Ratio (FDIR)

Method	Statistic	Prob.**	Cross-sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	–24.67	0.0000	118	944
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	–6.35	0.0000	118	944
Augmented Dickey Fuller - Fisher Chi-square	430.5	0.0000	118	944
PP - Fisher Chi-square	503.3	0.0000	118	1062

Trade Ratio (TR)

Method	Statistic	Prob.**	Sections	Obs.
Null: Unit root (assumes common unit root process)				
Levin, Lin & Chu t*	–5.26	0.0000	118	943
Null: Unit root (assumes individual unit root process)				
Im, Pesaran and Shin W-stat	2.37312	0.0579	118	943
Augmented Dickey Fuller - Fisher Chi-square	195.628	0.0038	118	943
PP - Fisher Chi-square	216.693	0.0000	118	1061

Table 6. GMM Estimation results: Impact of terrorism on FDI and trade

	LFDIR		LTR	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
LFDIRLAG	0.67***	0.020		
LTRLAG			1.01***	0.035
LMER	–0.12*	0.173	–0.28**	0.224
NTA	–0.042*	0.036	–0.03**	0.044
J-Stat	7.30		0.099	
J-Prob	0.19		0.752	

Notes: LFDIR refers to the log value of FDI flow as a percentage of the country's total gross domestic product, and LTR refers to the log value of trade ratio. LFDIRLAG and LTRLAG refer to the one year lag values of LFDIR and LTR. LMER is the log level of a country's military expenditures as a portion of GDP. NTA captures the total number of terrorist attacks. The null hypothesis of testing the over-identifying restrictions (the J-statistics) is that there is no correlation between the instrument and error term. *,**,*** represent significance at 10%, 5% and 1% levels, respectively.

Table 7. Robustness results: Impact of terrorism on FDI and trade

	LFDIR		LTR	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
Panel A: NTA (number of terrorist attacks) is replaced with NTK (number of terrorism killings), as represented by equations 3 & 5				
LFDIRLAG	0.68***	0.082		
LTRLAG			1.07***	0.061
LMER	0.003	0.171	–0.001*	0.0008
NTK	–0.115*	0.069	–0.001***	0.0003
J-Stat	4.77		6.56	
J-Prob	0.19		0.25	
Panel B: NTA (number of terrorist attacks) is replaced with NTI (number of terrorism injured) as represented by equations 4 & 6.				
LFDIRLAG	0.66***	0.033		
LTRLAG			1.03***	0.033
LMER	–0.099	0.153	–0.25*	0.198
NTI	–0.015***	0.010	–0.04**	0.019
J-Stat	6.87		6.22	
J-Prob	0. 22		0.28	

Notes: LFDIR refers to the log value of FDI flow as a percentage of the country's total gross domestic product, and LTR refers to the log value of trade ratio. LFDIRLAG and LTRLAG refer to the one year lag values of LFDIR and LTR. LMER is the log level of a country's military expenditures as a portion of GDP. NTK and NTI represent the number of people either killed or injured because of terrorism activities, respectively. The null hypothesis of testing the over-identifying restrictions (J-statistics) is that there is no correlation between the instruments and error term. *,**,*** represent the significance at 10%, 5% and 1% levels, respectively.

Table 8. Impact of terrorism on trade and FDI: Developing vs. developed countries

Developing countries

	LFDIR		LTR	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
Model with NTA(number of terrorist attacks)				
LFDIRLAG	1.04***	0.055		
LTRLAG			1.02***	0.032
LMER	–0.04	0.086	–0. 21	0. 223
NTA	–0.03***	0.011	–0. 018**	0.056
J-Stat	4.07		7.43	
J-Prob	0.53		0.11	
Model with NTK(number of terrorism killings)				
LFDIRLAG	1.09***	0.058		
LTRLAG			1.10***	0.062
LMER	0.0005	0.107	–0.13*	0.285
NTK	–0.01*	0.008	–0. 235***	0.084
J-Stat	6.12		4.40	
J-Prob	0.30		0.35	
Model with NTA(number of terrorism Injured)				
LFDIRLAG	1.06***	0.052		
LTRLAG			1.05***	0.033
LMER	–0.032	0.090	–0.33	0.254
NTI	–0.004**	0.002	–0.25***	0.078
J-Stat	5.88		5.81	
J-Prob	0.32		0.21	

Developed countries

	LFDIR		LTR	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
Model with NTA(number of terrorist attacks)				
LFDIRLAG	1.11***	0.167		
LTRLAG			0.72***	0.087
LMER	–8.56	5.04	–0.067***	0.016
NTA	–1.11	0.594	–0.003	0.002
J-Stat	2.94		7.53	
J-Prob	0.70		0.18	
Model with NTK(number of terrorism killings)				
LFDIRLAG	0.96***	0.095		
LTRLAG			0.72***	0.118
LMER	–3.53	6.187	–0.065***	0.022
NTK	–0.44	0.211	–0.001**	0.008
J-Stat	3.25		9.83	
J-Prob	0.66		0.08	

	LFDIR		LTR	
Variable	Coefficient	Std. Error	Coefficient	Std. Error
Model with NTA(number of terrorism Injured)				
LFDIRLAG	0.98***	0.098		
LTRLAG			0.69***	0.126
LMER	–3.46	5.98	–0.07***	0.023
NTI	–0.42**	0.190	–0.003***	0.001
J-Stat	3.28		8.61	
J-Prob	0.65		0.13	

Notes: LFDIR refers to the log value of foreign direct investment flow as a percentage of the country's total gross domestic product, and LTR refers to the log value of trade ratio. LFDIRLAG and LTRLAG refer to the one year lag values of LFDIR and LTR. LMER is the log level of a country's military expenditures as a portion of GDP. NTA captures the total number of terrorist attacks. NTK and NTI represent the number of people either killed or injured because of terrorism activities, respectively. The null hypothesis to test the over-identifying restrictions (J-statistics) is that there is no correlation between the instrument and error term. *,**,*** represent significance at 10%, 5% and 1% levels, respectively.

APPENDIX

List of the countries included in the study

Albania	Dominican Rep.	Lebanon	Russia
Algeria	Ecuador	Lesotho	Rwanda
Argentina	Egypt	Liberia	Saudi Arabia
Armenia	El Salvador	Lithuania	Senegal
Australia	Estonia	Luxembourg	Serbia
Austria	Ethiopia	Macedonia	Seychelles
Azerbaijan	Fiji	Madagascar	Sierra Leone
Bahrain	Finland	Malawi	Singapore
Bangladesh	France	Malaysia	Slovak Rep.
Belarus	Georgia	Mali	Slovenia
Belgium	Germany	Mauritius	South Africa
Belize	Ghana	Mexico	Spain
Bolivia	Greece	Moldova	Sri Lanka
Bosnia	Guate Mala	Mongolia	Swaziland
Botswana	Guyana	Morocco	Sweden
Brazil	Honduras	Mozambique	Switzerland
Brunei	Hungary	Namibia	Tanzania
Bulgaria	India	Nepal	Thailand
Burkina Faso	Indonesia	Netherland	Timor-Leste
Cabo Verde	Iran	New Zealand	Trinidad
Cambodia	Ireland	Nicaragua	Tunisia
Cameroon	Israel	Nigeria	Turkey
Canada	Italy	Norway	Uganda
Chile	Jamaica	Oman	Ukraine
China	Japan	Pakistan	UAE
Colombia	Jordan	Papua Guinea	Uganda
Congo	Kazakhstan	Paraguay	UK
Côte d'Ivoire	Kenya	Peru	USA
Croatia	Korea, Rep.	Philippines	Uruguay
Cyprus	Kuwait	Poland	Vietnam
Czech Rep.	Kyrgyz Rep.	Portugal	Zambia
Denmark	Latvia	Romania	