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THE NEXUS BETWEEN TERRORISM, INVESTMENT AND GROWTH: AN ANALYSIS OF MUSLIM DEVELOPING COUNTRIES

Abstract

Terrorism has greatly influenced the economies in the world; especially the Muslim economies which were on the track for development are devastated by this global calamity. This study explores the implications of inflicted terrorism on the investment and growth of 26 Muslim countries. Feasible generalized least square (FGLS), difference generalized method of moment (DGMM) and system generalized method of moments (SGMM) approaches were used to ensure robust results. For all specifications of estimation, we have confirmed that increase in the terrorism leads to decrease in investment directly, also it lead to decrease in the marginal positive impact of growth on investment. The results indicates the public policy efforts to mitigate the loss of private investment which can be done initially by public investments to ensure public safety.

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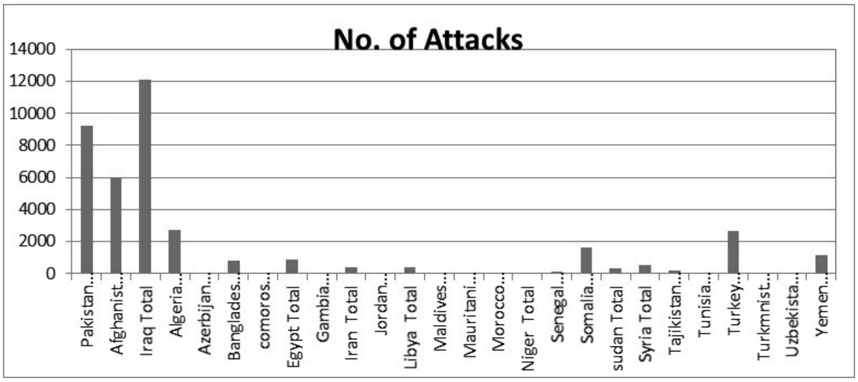
1. Introduction

It has been long tradition that economists search for the economic consequences of world peace and conflict. Terrorism creates a level of fear and uncertainty among people and increases the cost of doing business. It lowers output, tourism and economic growth (Keefer and Loayza 2008). In comparison to internal and external conflict, the study of terrorism in relation to economic indicators gains less attention in the literature of economics. The consciousness of human losses due to incidences of terrorism and the redirection of resources as a result of perceived risks have focused our attention towards better understanding the relationship between terrorism and economic factors.

Over the last 14 years more than 48,000 incidence of terrorism has been recorded and more than 107,000 lives were lost around the globe. Most of the terrorist attacks were experienced by Muslim's Developing Countries. However, 78% of terrorist attacks were occurred in Iraq, Afghanistan, Pakistan, Nigeria and Syria (Global Peace Index 2015). Figure 1 shows that majority of the terrorist attacks were experienced by Iraq, Afghanistan and Pakistan in last two decades. Iraq experienced more than 12,000 incidence of terrorism, While Pakistan and Afghanistan experienced more than 6,000 incidence of terrorism from 1990 to 2015. However, Algeria and turkey faced more than 2,000 terrorist attacks in last two decades. Economists such as Kai (2006), Caplan (2006) and Becker (2011) try to define the terrorism with economic reasoning after the incidence of 9/11. These authors find that terrorist activities reduce the level of output by a certain amount; due to damage of infrastructure, which occurs in result of terrorism. Increase in terrorism, retards FDI, lowers output, harms infrastructure, lessens trade and cuts economic growth. In recent study Bandyopadhyay et al. (2014) present the effect of terrorism on FDI for the panel of 78 developing countries from 1984 to 2008. They find that a significant increase in terrorism will reduce the level of FDI of host country.

Figure 1. Number of Terrorist attacks across Muslim Developing Countries from 1990 to 2015



Source: Global Terrorism Database (2015)

Terrorism reduces the level of investment in country due to fear of insecurity and damage of substructure after terrorism. Moreover, foreign companies also hesitate to invest in a country pertaining high level of terrorism. Whenever, there are incidences of terrorism in any country the level of investment declines; which shows that terrorism act as a cost to investment, (Spich and Grossee 2005). In addition, Enders et al. (2006) elucidate the association between terrorism and US FDI. They use time series and panel data analysis and find that the incidence of 9/11 bring the FDI of US down. However, in panel estimation of 69 countries; they find insignificant relationship between FDI and transnational terrorism. Abadie and Gardeazabal (2008) estimate the effect of terrorism on FDI, keeping in view the panel estimation of 186 countries. Their results shows that with the increase in risk in country can reduce the FDI position by 5% of GDP because FDI is a major source of saving in order to support economic growth, especially in developing regions. Furthermore, Spich and Grossee (2005) argue that terrorism reduces the cross national trade and investment when government imposes the anti-terrorism policies. For example, the efficiency of international logistic and shipping will decrease when policies like inspection of shipping containers and security programs were introduced to protect the ports. These findings are consistent with the study of (Czinkota et al. 2004; Enders et al. 2006). However, Bouchet (2004) shows that terrorism reduces the risk taking attitude of managers. The portfolio managers, exporters and lenders feel fear to allocate their assets in abroad because of risk due to terrorism. The areas which are characterized by risk and volatility have less FDI and portfolio investment.

Li and Schaub (2004) argues that majority of terrorist attacks occurs in those areas which are characterized by low economic development, poverty and ungoverned spaces. Underdeveloped areas are those in which government fail to provide the basic needs, such as infrastructure or the rule of law. FDI, portfolio investment and cross country trade will reduce the terrorist activity. Sustainability of international business will reduce the poverty and other social issues in developing countries. Such policies will improve the socio economic indicators and reduce the incidence of terrorism. However, Abadie and Gardeazabal (2003) find the relationship between terrorist activity and economic impact on firm in Spain. They explain that terrorist attacks have adverse effect on the economic conditions of firm. Furthermore, Glick and Rose (2002) explain the negative relationship between trade and number of terrorist attacks. They incorporate the sample of 217 countries and include the terrorist activities from 1948 to 1997, while Enders and Hoover (2012), explain the nonlinear relationship between income and terrorism. They found that GDP per capita has strong nonlinear effect on transnational terrorism for the sample of 172 countries.

Gries et al. (2011) shows that economic growth leads to increase in terrorist activity in robust ways, In case of bivariate analysis, the relationship between terrorism and economic growth is strong while in case of trivariate specification, the impact of terrorism on economic growth diminishes. Shahbaz (2013) reveals the positive relationship between inflation economic growth and terrorism in case of Pakistan by using time series data from 1971 to 2010. Another study of Shahbaz et al. (2013) confirms the long run relationship between terrorism and economic growth by Granger causality analysis from 1971 to 2010. The result of granger causality shows that terrorism granger cause of economic growth. Shahzad et al. (2016) divides the data in two parts i.e. pre 9/11 (1988-2001) and post 9/11 (2002-2010) periods. The result provides the long run relationship between terrorism, FDI and economic growth in case of Pakistan. Granger causality reveals the bidirectional long and short run causality between FDI and economic growth in both samples. When country experiences high level of growth in industrial sector, they will experience less domestic and transnational terrorist attacks, but they disposed to more suicide attacks, (Choi 2015).

In addition, Niskanen (2006) argues that terrorism increases the military expenditures and private resources were used in order to counter the terrorism. Military expenditures were increased by $100 billion of United States from 2001 to 2005 for war against terrorism in Afghanistan and Iraq. However, the cost of US Transportation security administration is $5 billion per year for search procedures on airports. Firms have to pay additional billions of dollars annually because of risk and threat of terrorism. However, Gori (2004) shows that increase in terrorism also increase the transaction cost of international business to both defend against terrorism and comply with government mandates intended to improve the security. The above findings are consistent with the findings of Barnes and Oloruntoba (2005) and Eggers (2004).

The objective of our study is to present a dynamic panel investigation of the effect of terrorism on investment. A crucial distinction of our study is the inclusion of domestic terrorism. Domestic terrorism occurs where victims, perpetrators and targets are all from the venue countries. Such incident may deter the level of investment through political instability and high level of uncertainty. However, the effect of terrorism on investment among Muslim developing countries was meagerly studied. There are few studies such as Keefer and Loayza (2008) and Sandler and Enders (2008), which describes the relationship between terrorism and FDI in developing countries. Terrorism and their economic consequences were researched broadly in developed countries but these studies did not discuss the Muslim developing countries; which accounts the major incidence of terrorist attacks. However, this study will bridge this gap.

Our study finds a negative relationship between terrorism and investment. Keeping in view, the fully specified model, a standard deviation increase in terrorism per 100,000 persons lowers the investment/GDP by 0.194%, 0.485% and 0.835% for the case of feasible generalized least square (FGLS), difference generalized method of moments (DGMM) and system generalized method of moments (SGMM). Meanwhile, economic growth shows positive, while interest rate shows negative and significant impact on investment for the case of all base line and fully specified model by considering all three above mentioned techniques.

The study organizes as follows: section II presents the discussion on data and empirical model with econometric irregularities, while section III presents the explanation of estimated results which contribute the deeper understanding that how terrorism effects investment among Muslim's developing countries. Section IV concludes the study with policy implication.

2. Data and Empirical model

Data regarding incidence of terrorism are obtained from global terrorism database (2015), while economic data are obtained from world development indicators (WDI 2015). The data on external and internal conflict have been extracted from global conflict risk index (GCRI 2015). The dynamic panel data model is used in order to analyze the effect of terrorism on investment of Muslim developing countries for the period of 1990-2015.

$$I_{it} = f\left(I_{i,t-1}, T_{it}, X_{it}\right) \tag{1}$$

In above mentioned model, i represent the country and t refers the time period. Investment is expressed as percentage of GDP. However, lagged Investment/GDP represents the persistence of Investment, (denoted by It-1), which is used by following studies, such as (Asiedu et al. 2009; Asiedu and Lien 2011). However, Enders et al. (2006) reveals that terrorist attacks will reduce foreign direct investment (FDI) due to disruption, damage of infrastructure and enhanced security. T denotes the number of incidence of domestic terrorism per 100,000 persons. While the X symbolizes the effect of other control variables on Investment like interaction term, growth of GDP, interest rate, exchange rate, education, trade, internal and external conflicts. Our basic regression framework is given below

$$\begin{aligned} I_{it} &= \alpha + \beta T_{it} + \delta I_{t-1} + \varphi_1 IN_{it} + \varphi_2 Y_{it} + \varphi_3 i_{it} + \varphi_4 Ex_{it} + \varphi_5 E_{it} \\ &+ \varphi_6 TO_{it} + \varphi_7 IC_{it} + \varphi_8 EC_{it} + \varepsilon_{it} \end{aligned} \tag{2}$$

"Y" is growth of real GDP, "i" is interest rate and "Ex" is exchange rate; which captures the expected returns on investment, (Bandyopadhyay et al. 2014). "E" is education, which represent the mix results with investment because multinational firms want to prefer operation in countries with low literacy rate, while multinational firms also require high skilled labor force and they choose country with high literacy rate (Blonigen 2005). "TO" is trade openness[1], open economies are mostly favored by export oriented investment, (Busse and Hefeker 2007). "IC" and "EC" represents the internal conflict and external conflict. "IN" is interaction term, the interaction term is the product of terrorism per 100,000 persons and military expenditure. Military expenditure is used for the reduction in terrorism and protection of any country, which further increase the level of investment in a country, (Abu Bader et al. 2003). The internal and external conflicts are represented by an index, which is composed of civil violence, ethnic violence and civil war varies from 0-10. The higher intensity of internal and external conflict reduces the level of FDI because of higher security risk (Global report 2009). If the intensity level of conflict is 0; it represents the absence of risk in that country. The risk level from 1-4 covers the conflict, which is conducted without the use of force, while the involvement of force or several conflict actors covers the intensity of scale from 5-7 and it also considered as violent conflict. The scale from 8-10 considered as highly violent conflict depending upon the number of causalities, refugees, the personnel involved as well as the other means and consequences. Table (1), reports the result of FGLS from the cross sectional investment regression, while Table (2) and (3) explains the result of difference and system method of moment, (Global Conflict Risk Index 2015).

3. Estimation Results

We use FGLS because OLS estimators are unbiased but no longer efficient in our study due to presence of heteroskedasticity[2]. Column (1) of Table (1); represents the Investment nexus growth model from the early literature of 1990's, while column (2) and (3) introduces the effect of external and internal conflict. Column (4) and (5) represents the terrorism separately and then comprise the other forms of conflict including terrorism in order to demonstrate that how different types of conflict and terrorism effects the investment.

In Table (1); Column (1), reports the result of standard Investment nexus growth model. Economic growth has positive and significant impact on Investment for the Muslim developing countries. Trade/GDP and lagged investment is positive and significant, while the interest rate, exchange rate

[1] Calculated by ratio of trade and GDP.
[2] We check the presence of heteroskedascity by using white test.

and education show negative and significant impact on investment. The sign of variables in column (1) is very similar to the other studies like (Syed et al. 2015, Blomberg et al. 2004) using different techniques and data sample. Column (2) and (3) shows that internal and external conflicts are positive and insignificant while rest of the control variables are negative and significant except trade/GDP and economic growth.

Column (5) of Table (1), includes terrorism and interaction term in order to check how investments effected by terrorism? The magnitude of its estimated impact shows that one standard deviation[3] increase in domestic terrorism per 100,000 persons will lead to decrease the net investment/GDP by 0.194%. If any country, whose Investment is US$100 million; the investment loss amount will be US$0.194 million for the average sample of Muslim developing country. The rest of the control variables are negative and significant except education and trade/GDP. The estimated coefficient of lagged investment/GDP is positive and significant in all columns.

The estimated coefficient of terrorism per 100,000 persons is -0.11, while the coefficient of lagged investment/GDP is 0.38. Thus, the long run effect of terrorism per 100,000 persons on investment/GDP is 0.177%. This elucidates that increase in terrorism by one standard deviation causes a reduction in investment/GDP of a country by 0.307% in the long run which is 0.11% greater as compare to short run effect, while the estimated coefficient of growth and other controlled variable is positive and significant except education and exchange rate. Conflicts and interest rate have unanticipated insignificant and positive sign, this unanticipated sign may be because of endogeneity bias in a model of FGLS.

There are two major issues related to endogeneity, first, terrorism lowers the level of output, which further reduces the level of investment. This can be eased by counterterrorism efforts of the government. Second, in national income account identity economic growth effects the investment endogenously. This raises the problem of endogeneity between terrorism, growth of GDP and investment. The conventional solution of endogeneity is to introduce the approach of instrumental variable. For multiple endogenous variables, it is difficult to find such instruments because any candidate instrument must be highly correlated with instrumented variable but uncorrelated with error term. This creates a risk of inconsistent estimate: due to possibility of correlation of unobservable panel-level effect with the

[3] Standard deviation of terrorism is 1.74

lagged dependent variable in the dynamic panel data model, (Bandyopadhyay et al. 2014).

Table 1. Feasible generalized square

Independent Variables	(1) Base FGLS	(2) & Internal Conflict FGLS	(3) & External Conflict FGLS	(4) & Terrorism FGLS	(5) & Terrorism, Internal conflict, External conflict FGLS
GDP growth rate	2.07*** (0.00)	2.07*** (0.00)	2.07*** (0.00)	-0.017 (0.42)	4.06*** (0.00)
Trade/GDP	10.85*** (0.00)	10.85*** (0.00)	10.85*** (0.00)	3.25*** (0.00)	15.38*** (0.00)
Interest rate	-0.342*** (0.00)	-0.34*** (0.00)	-0.34*** (0.00)	-2.64*** (0.00)	2.33*** (0.00)
***Ln*, Education (Secondary School Enrollment)**	-3.25*** (0.00)	-3.24*** (0.00)	-3.24*** (0.00)	0.14*** (0.00)	-3.99*** (0.00)
***Ln*, Exchange rate**	-5.47*** (0.00)	-5.48*** (0.00)	-5.47*** (0.00)	-6.26*** (0.00)	-4.98*** (0.00)
Investment/GDP, Lagged	0.26*** (0.00)	0.26*** (0.00)	0.26*** (0.00)	0.07*** (0.00)	0.38*** (0.00)
Internal Conflict		0.002 (0.59)			0.02** (0.00)
External Conflict			0.001 (0.76)		-0.01 (0.79)
Domestic Terrorism (Per 100,000 persons)				-0.11*** (0.00)	-0.11*** (0.01)
Domestic Terrorism ×Military expenditure/GDP				-0.23 (0.903)	1.15 (0.51)
Observation	598	598	598	366	366
R^2	0.94	0.94	0.94	0.96	0.96

P values are presented in round brackets. *; ** and *** represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Models (1)–(5) are different specifications of cross country investment-growth regressions. Models (1)–(4) are the basic FGLS model adding separately the different forms of conflict, i.e. terrorism, internal conflict, external conflict and their sum. However, R^2 represents the explained variation in dependent variable due to independent variable.

In view of above mentioned limitation, our study incorporate Generalized method of moments (GMM) estimation; which is also favored by many empirical studies like (Busse and Hefeker 2007; Asiedu et al. 2009).

However, Arellano and Bond (1991) shows that the difference generalized method of moment (known as DGMM) estimators introduce the lagged values of the first difference of endogenous variables as instrument and take the first difference of the data. The difference- GMM not only resolve the problem of endogeneity but also makes the variables stationary. After taking the difference of all variables, it takes the following form.

$$I_{it} - I_{i,t-1} = \alpha + \beta\left(T_{it} - T_{i,t-1}\right) + \delta\left(I_{i,t-1} - I_{i,t-2}\right) + \varphi\left(X_{it} - X_{i,t-1}\right) + \left(\varepsilon_{it} - \varepsilon_{i,t-1}\right) \tag{3}$$

Interest rate, lagged investment/GDP and education are negative and significant, while trade/GDP and exchange rate is positive and significant in column (1) of Table (2). The value of coefficient is -0.27

Table 2. Panel regression using DGMM

Independent Variables	(1) Base DGMM	(2) & Internal conflict DGMM	(3) & External conflict DGMM	(4) & Terrorism DGMM	(5) & Terrorism, Internal conflict, External conflict DGMM
GDP growth rate	0.17*** (0.00)	0.25*** (0.00)	0.24*** (0.00)	0.11*** (0.00)	0.12*** (0.00)
Trade/GDP	11.79*** (0.00)	12.69*** (0.00)	12.79*** (0.00)	15.87*** (0.00)	16.02*** (0.00)
Interest rate	-1.85*** (0.00)	-0.67*** (0.05)	-0.61** (0.07)	-0.05*** (0.00)	-0.07 (0.88)
***Ln*, Education (Secondary School Enrollment)**	-4.68*** (0.00)	-4.22*** (0.00)	-4.18*** (0.00)	-4.64*** (0.00)	-4.62*** (0.00)
***Ln*, Exchange rate**	0.31 (0.53)	3.28*** (0.00)	3.52*** (0.00)	2.83** (0.01)	2.64*** (0.02)
Investment/GDP, Lagged	-0.85*** (0.00)	-0.20*** (0.00)	-0.20*** (0.00)	0.09** (0.06)	0.09*** (0.05)
Internal Conflict		0.07** (0.06)			0.05 (0.23)
External Conflict			0.023 (0.67)		0.04 (0.32)
Domestic Terrorism (Per 100,000 persons)				-0.27*** (0.01)	-0.28*** (0.00)
Domestic Terrorism ×Military expenditure/GDP				-2.66 (0.69)	-3.75 (0.58)
Observation	572	546	546	217	217

P values are presented in round brackets. *; ** and *** represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Models (1)–(5) are the difference generalized method of moment (DGMM) for different specifications of cross country investment-growth regression.

and -0.28 for baseline and fully specified model in column (4) and (5), which confirms the decrease of 0.46% and 0.48% in the value of investment/GDP due to a standard deviation increase in terrorism per 100,000 persons while, the rest of the variables are positive and significant except interest rate and education in both baseline4 and fully specified5 model of DGMM. The estimated coefficient of lagged investment/GDP is same for baseline and fully specified model (0.09) specifies the long run effect of domestic terrorism per 100,000 persons on Investment/ GDP are 0.29% and 0.30% for baseline and fully specified model in DGMM of column (4) and (5). A standard deviation increase in terrorism per 100,000 persons will lower the value of investment/GDP by 0.51% and 0.52% in the long run for both the models of DGM. Taking account the problem of endogeneity, Arellano and Brover (1995) elucidates that difference-GMM with lag values often act as poor instruments for the first differences. In order to resolve this problem, Blundell and Bond (1998) use the system GMM estimators, which kept in view the additional moment conditions. For each regression, study incorporates two step GMM estimators. This regression will be efficient and robust to all kind of heteroskedasticity (Asiedu and Lein 2011).

[4] Baseline model, includes the variables of terrorism and interaction term
[5] Fully specified model, includes both types of conflicts and terrorism

Table 3. Panel regression using SGMM

Independent Variables	(1) Base SGMM	(2) & Internal conflict SGMM	(3) & External conflict SGMM	(4) & Terrorism SGMM	(5) & Terrorism, Internal conflict, External conflict SGMM
GDP growth rate	0.31*** (0.00)	0.32*** (0.00)	0.31*** (0.00)	0.30*** (0.00)	0.30*** (0.00)
Trade/GDP	13.04*** (0.00)	13.12*** (0.00)	13.15*** (0.00)	14.80*** (0.00)	15.40*** (0.00)
Interest rate	-1.69*** (0.00)	-1.69*** (0.00)	-1.68*** (0.00)	-1.01*** (0.00)	-0.92*** (0.00)
***Ln*, Education (Secondary School Enrollment)**	-4.18*** (0.00)	-4.18*** (0.00)	-4.18*** (0.00)	-3.69*** (0.00)	-3.68*** (0.00)
***Ln*, Exchange rate**	-0.19*** (0.00)	-0.52 (0.19)	-2.67 (0.50)	1.82*** (0.00)	1.85*** (0.00)
Investment/GDP, Lagged	-0.30*** (0.02)	-0.30*** (0.00)	-0.30** (0.00)	-0.34*** (0.00)	0.35*** (0.00)
Internal Conflict		0.10*** (0.01)			-0.08** (0.00)
External Conflict			0.03 (0.53)		0.15*** (0.00)
Domestic Terrorism (Per 100,000 persons)				-0.28*** (0.00)	-0.48*** (0.00)
Domestic Terrorism ×Military expenditure/GDP				-3.75 (0.42)	-3.15 (0.43)
Observation	598	598	598	366	366

P values are presented in round brackets. *; ** and *** represent statistical significance at the 0.10, 0.05 and 0.01 levels, respectively. Models (1)–(5) are system generalized method of moment (SGMM) for different specifications of cross country investment-growth regression

Table (3) explains the result of system GMM. In column (1) of Table (3), elucidates that all variables shows negative and significant impact on investment except growth and trade/GDP. The exchange rate is negative and significant in baseline but positive in fully specified model of system GMM. However, the rest of variables of the variables are positive and significant except interest rate and education baseline model. In conclusion of our results; Column (5) in Table (3), reports that growth, trade/GDP improves the level of investment across Muslim developing countries while, education, interest rate and internal conflicts exhibits negative and significant relationship with investment. The sign of terrorism confirms the negative relationship between terrorism per 100,000 persons and investment/GDP. A standard deviation increase in terrorism per 100,000 persons will decrease the investment/GDP from 0.835% (for fully specified model of SGMM) to 0.504% (for baseline model in column (7), of SGMM). The internal conflict shows the negative and significant impact on investment/GDP in column (10). The long run impact of terrorism per 100,000 persons on investment/GDP is 0.73% in fully specified model. It means that a standard deviation increase in terrorism per 100,000 persons will lowers investment/GDP by 1.28% in the long run.

In summary, the results of panel and cross country Muslim developing countries have common findings that terrorism and interest rate have strong negative impact on investment. It remains true while controlling the other types of conflict and endogeneity concerns. However, internal and external conflicts do shows much relationship with investment. In short, terrorism has small but negative and significant impact on total investment.

4. Concluding Remarks

Study examines the relationship between terrorism and investment/GDP for the case of 26 Muslim's developing countries; covering the period of more than two decades (1990-2015). Study applies different econometric techniques in order to ensure the robustness and consistency of our estimates. The study first utilizes the feasible generalized least square (FGLS) because OLS estimators are biased due to presence of heteroskedasticity. The result of FGLS endeavors the basic results that terrorism lowers and economic growth improves the investment. However, endogeneity problem prevails in a model because economic growth effects investment endogenously. Study applies difference generalized method of moment (DGMM) and system generalized method of moment (SGMM) due to presence of endogeneity. A standard deviation increase in terrorism per 100,000 persons lowers the value of investment/GDP. However, GDP growth shows positive impact on investment, keeping in view all three techniques named as FGLS, DGMM and SGMM.

Furthermore, lagged value of investment/GDP shows the positive and significant relationship with terrorism per 100,000 persons, which confirms that terrorism, lowers the value of investment in long run. In addition, the effect of terrorism on investment in the long run is greater in SGMM as compare to DGMM in fully specified model. The relationship between interest rate and investment is negative and significant in all above mentioned three techniques. The increase in investment due to economic growth is greater in case of SGMM as compare to DGMM in all five models by taking economic growth as endogenous variable. Nevertheless, finding of study suggests that nature of the terrorism evolved in many ways; which cannot be detect from data. Historical evidence may not be used a good method in order to identify the consequences of terrorism in future. Our findings suggests that macroeconomic consequences of terrorism are potentially quiet significant, which confirms the prerequisite for a redoubling of public policy efforts towards examining how to best mitigate the associated risk.

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