

**ECONOMIC COST OF TERRORISM IN PAKISTAN: A  
SYNTHETIC CONTROL ANALYSIS**



By

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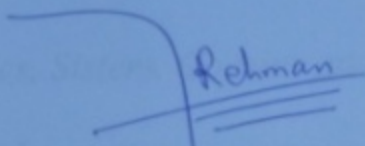


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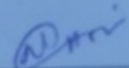
## CERTIFICATE

This is to certify that this thesis entitled: "**Economic Cost of Terrorism in Pakistan: A Synthetic Control Analysis**" submitted by Mr. Muhammad Naeem Khan is accepted in its present form by the Department of Economics, Pakistan Institute of Development Economics (PIDE), Islamabad as satisfying the requirements for partial fulfillment of the degree of **Master of Philosophy in Economics**.

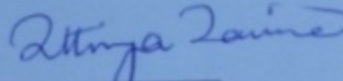
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*Dedicated to*

*My Beloved Parents, Uncles, Sisters, Cousins and*

*Friends*

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## **List of Acronyms**

GCF	Gross Capital Formation
GDP	Gross Domestic Product
GTD	Global Terrorism Databases
DID	Difference in Difference
FDI	Foreign Direct Investment
PPP	Purchasing Power Parity
SCM	Synthetic Control Method
SEZ	Special Economic Zones
SP	Synthetic Pakistan
UNESCO	United Nations Educational, Scientific, and Cultural Organization
UNPD	United Nations Population Division
UNSD	United Nations Statistics Division
WB	World Bank
WDI	World Development Indicators
WGI	World Governance Indicators
WPP	World Population Projections

## **Abstract**

This Study intended to estimate the causal effect of terrorism in Pakistan in terms of output loss with the help of Synthetic Control Method (SCM). SCM is statistically advanced data driven technique that involves the construction of counterfactual of treated unit (Pakistan) on the basis of pre-defined variable of interest (GDP per capita). The Synthetic Pakistan is obtained from a convex hull of countries listed together on the basis of structural and growth similarity with Pakistan. This study contributes to the literature of growth-terrorism nexus in case of Pakistan by estimating the causal negative effect of terrorism on GDP per capita. The second major contribution is the identification of potential channels of output loss in terms of foregone domestic and foreign investment. Major findings of the model suggest that Pakistan's economy suffered a loss of 260 dollar per capita, PPP (constant 2011 international dollar) on average during the 2007-2014 termed as a post terrorism era. The decline in the investment is found to be the major contributor to this loss with 5.27 percentage point reduction on average in the terrorism period. Moreover, the downfall of foreign capital inflows also accelerate the economic cost of terrorism with an estimated average drop of 1.57 percentage point over the post terrorism period. One of the plausible avenue for future research is the investigation of the other potential channels of the output loss in the Pakistan due to terrorism.

# CHAPTER 1

## INTRODUCTION

*“Terrorism is the unlawful use of force or violence against persons or property to intimidate or coerce a government, the civilian population, or any segment thereof, in furtherance of political or social objectives”.*

FBI (2012 p. 1)

### 1.1 Background of the Study

Modern world faces terrorism as a great threat to the globe in the post-cold war era, as it completely shakes the whole world. The ideology of extremism and unlawful use of force is not the phenomenon of twenty first century, but the narrative about this great threat immensely evolved due to the attack of September 11, 2001 in the US. Various groups use terrorism or activities of violence by intimidating the government to manipulate policy goals in favour of these groups (Brandt and Sandler, 2009). Similarly, Sandler and Enders, (2004) state that terrorist differ from each other on the basis of their motives and outlined a standard pattern of their conduct of activities in terms of bombings, suicide attacks, hijackings, assassinations, kidnappings and threats. The broad objective of their activities is to secure political concessions and their social gains by pressuring the government.

Terrorism or civil wars increase uncertainty and insecurity in a society and thus lead to the deterioration of the property rights in a country (Collier, 1999). Fratianni and Kang, (2004) point out the measures conducted by government to cater the changing environment with the allocation of resources to maintain the rule of law, insurance of property rights and reduction of uncertainty by forming counterterrorism agencies or departments. These measures imply a resource reallocation mainly diverted to military and security spending, which was quantified by Knight *et al.*, (1996).

Moreover, the cost to the economy due to capital outflows, fall in export, and tourism demand were also quantified by various studies as a significant loss to the economy.

On the other hand, the foremost cost of terrorism is the loss of human lives and health costs due to injuries and mental stress suffered by individuals exposed to the terrorist attacks. The behavioural and psychological effects of terrorism to the society are far more devastating and long lasting as compared to the income losses incurred due to terrorism. The prominent effects include posttraumatic stress disorder, alteration of attitude towards risk, depression, and anxiety (DiMaggio and Galea, 2006; Nasir *et al.*, 2016). These psychological and behavioural effects imply a huge cost to the citizens of the world in terms of their treatment and recovery to the normal life. The ultimate goal of terrorism is to spread panic, fear, vulnerability and uncertainty in order to cash the political or social goals (Yehuda and Hyman, 2005) and it also affect political behaviour of individuals toward democratic institutions (Rehman and Vanin, 2017).

Pakistan is culturally a diverse society with a huge ethnic and religious fragmentation and is located at the heart of geopolitical spectrum in the region. Its geopolitical position inflicted severe political, social and religious hazards to the country from the shocks in neighbouring countries. The post September 11, 2001 terrorism in Pakistan has historical roots and the phenomena of violence had its historical background, particularly ethnic and political violence (Saeed *et al.*, 2014). The post 9/11 joining of Pakistan in the war against terrorism resulted in a massive backlash from the militant groups in the form of suicide bombings, assassinations, kidnapping. Terrorist targeted the military and government officials as well as innocent civilian population. Public and private properties, religious and educational experts, specialist doctors and highly skilled labour and officials were also targeted. Furthermore, the devastation of infrastructure (public and private) and social capital in

terms of damaging the schools, building for Religious offering, hospitals and social fabric enormously eroded the country. These effects inflicted significant monetary and human cost to the society apart from the destruction of the international image of Pakistan in the world.

The latest government estimates show that economy suffered a loss of US\$ 118.31 billion due to terrorism and violence during 2001 to 2016, where the decline in exports, foreign direct investment and tax collection contributed massively to these cost calculations.<sup>1</sup> While human fatalities amounted to 61487 in total due to activities of terrorism.<sup>2</sup> These estimates are based on the classical accounting method. While some studies investigated the cost to the economy based on scientific methods proposed by economic theory making use of econometric models and methodologies [Malik and Zaman, (2013); Raza and Jawaid, (2013); Mehmood, (2013); Shahbaz *et al.*, (2013)].

## **1.2 Problem Statement**

The literature shows that there is a need to examine in depth the economic cost of terrorism in the case of Pakistan. The issue is of high importance as Pakistan is among the highest victim of terrorism and suffered huge economic, social and political losses. The study aimed to accomplish this task with the help of recently developed data driven methodology called Synthetic Control Method to explore the appropriate economic cost of terrorism in Pakistan. Moreover the investigation of economic cost would guide us to realize the threat of terrorism more acute and deal it appropriately with full power and by working out a comprehensive plan to curb it.

The existing literature relating to economic cost of terrorism in Pakistan is not sufficed to highlight this problem and due to the challenge of aggregation and mis-

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<sup>1</sup>Source: Economic Survey of Pakistan, (2015-16).

<sup>2</sup> Source: South Asia Terrorism Portal, (2016).

measurement issue, these cost calculation lack reliability. Furthermore, the relationship of socioeconomic conditions with political violence or terrorism is intricate and ambiguous. The present study is devised to thoroughly examine economic cost of terrorism using Synthetic Control Method (SCM) by constructing a counterfactual of Pakistan from a donor pool of countries. This methodology does not allow the extrapolation biases that generate an inference from hidden parameters and also account for endogeneity caused by omitted variable bias with flexibility granting to time invariant unobservable confounders to vary over time. These were the two major issues associated with the previous studies that produced biased estimates of economic cost of terrorism.

### **1.3 Objectives of Study**

Broadly, there are two objectives of the study

- a) To calculate economic cost of terrorism by evaluating per capita GDP loss during the severe terrorist attacks with the help of Synthetic Control Method.
- b) To disentangle the potential channels through which economic growth was retarded and posed economic cost in Pakistan at the time.

### **1.4 Key Findings**

The key findings of the model suggest that economy of Pakistan suffered a loss of 260 dollar per capita, PPP (constant 2011 international dollar) on average during the 2007-2014 termed as a post terrorism era as compared to the Synthetic Pakistan (obtained from a weighted average of countries not exposed to terrorism). The decline in the investment is found to be the major contributor to this loss with 5.27 percentage point reduction in domestic investment on average in the terrorism period. Moreover, the downfall of foreign direct investment net inflows also accelerate the economic cost

of terrorism with an estimated average drop of 1.57 percentage point over the post terrorism period.

### **1.5 Contribution and Significance of Study**

This study contributes to the literature of growth-terrorism nexus in case of Pakistan by estimating the causal negative effect of terrorism on GDP per capita. This gap is addressed with the help of Synthetic Control Method which helped in the construction of counterfactual of Pakistan and then their comparison provide a causal negative effect of terrorism. The second major contribution is the identification of potential channels of output loss in terms of foregone domestic and foreign investment during the post-treatment period.

Based on the identified potential channels of the loss the authorities should try to ensure the security and stabilization of business environment in the country which is the more generic policy recommendation. The government should try to reduce the ex-ante and ex-post cost of doing business in the country which will help the country to rank better in the world for investment. These measures by government will lead to encourage investment in the country to some extent despite the lack of full proof security situation.

The study emphasizes on the economic consequences of violent conflicts and terrorism as the current data at hand is relatively more reliable and subject to low degree of aggregation and mis-measurement issue as compared to non-economic cost indicators. The aspects of human and social costs of terrorism are at a very pinnacle in Pakistan, but the issues of measurement and aggregation in data confined the study to focus on economic cost of terrorism and estimated the economic cost during the period of severe terrorist attacks in Pakistan.

The counterfactual of Pakistan is constructed from a convex hull of units listed in donor pool that consist of countries possessing structure and growth dynamics similar to Pakistan except Pakistan faces an extreme wave of terrorist attack after 9/11. This feature of the study is the major deviation from the past studies that have estimated the economic cost of terrorism within a country as well as in a standard cross country regression analysis. The selection of various countries allowed us to develop a Synthetic Pakistan, which shows what would have the level of GDP per capita if the country (Synthetic Pakistan) did not face severe attacks of terrorism by comparing it with actual GDP per capita of Pakistan in the post 9/11 era.

The remaining study proceeds in the following manner; Chapter 2 discuss the existing literature of economic cost of terrorism and conflicts. In Chapter 3, the theoretical framework regarding growth conflict nexus is outlined. Chapter 4 provide details of the data used for investigation and introduces the Synthetic Control Methodology. The results of the study are discussed in Chapter 5 along with the potential channels of economic loss and chapter 6 concludes the study with future avenues of research.



## CHAPTER 2

### LITERATURE REVIEW

#### 2.1 Introduction

This section briefly explores the literature on economic cost of terrorism and conflicts. A vast strand of literature is attributed to the study of economic cost of terrorism and conflicts. This section contains two subsections where the first subsection briefly summarizes the economic cost of terrorism and conflicts. In the next subsection we will review the econometric techniques and methods used to evaluate the cost of terrorism and develop a rationale for using the Synthetic Control Method for assessing the economic cost of terrorism and conflicts.

#### 2.2 Economic Cost of Terrorism

In this section existing literature regarding economic cost of terrorism and violent conflicts is outlined. The review of literature will be presented as it evolved about economic understanding of costs of terrorism in the economy.

Terrorism affects economic growth through its detrimental effects on various sectors of the economy and directly economic growth as well. The earlier studies examined the implications of terrorism and violence on the tourism industry of a country subject to violence. Enders and Sandler, (1991) pioneered in investigating the effects of terrorism on tourism industry of Spain by developing a methodology to accomplish their inquiry. Similarly, terrorism adversely affects the tourism industry in a large group of countries that face terrorism [Enders *et al.*, (1992); Pizam and Smith, (2000); Drakos and Kutan, (2003); Rodriguez, (2016)].

The climate of fear and violence severely affects the human behaviour and decision of individuals belonging to every realm of life. These decision makings have perpetual effects for the economy, specifically the decision relating to consumption and

investment. In the Post 9/11 world terrorism has very substantial repercussions for the capital inflows in the countries affected by terrorism, but these repercussions were also present in the economies affected due to terrorism in pre 9/11 era (Enders and Sandler, 1996). The literature regarding capital thwarting implications of terrorism for recipient country of capital became more prominent and evolved after the attack of September 11, in the United States. These studies documented the negative effects of capital inflows in a country suffering from a terrorist attack or other acts of violence [Enders *et al.*, (2006); Stanistic, (2006); Abadie and Gardeazabal, (2008); Bandyopadhyay *et al.*, (2014); Filer and Stanistic, (2016)]. It is important to mention that these studies only documented the effects of terrorism on capital inflows in a country.

In the jargon of economics, consumption pattern of individuals dictates their welfare stance and it is plausible to examine the pattern of consumption to observe the welfare gain or loss of individual due to their exposure to terrorism. Numerous studies have evaluated the impacts of terrorism and violence on consumption behaviour of individuals and concluded that terrorism and violence have substantial adverse effects for consumer behaviour and its growth. These deleterious effects inflict huge welfare losses to the individuals and inversely affect the economic wellbeing of the agents (Hess, 2003; Frey *et al.*, 2007; Serneels and Verpoorten, 2012).

The activities of violence and terrorism retard the production process and this may delay the production order (domestic and foreign). The literature relating to terrorism effects on international trade suggested that bilateral exchange of goods and services were more prone to the adverse effects. An empirical finding suggested that violence and terrorism reduced the volume of trading commodities and services across nations. Some of the major studies by Nitsch and Schumacher, (2004); Mirza and Verdier, (2008) documented these findings. Furthermore, the financial markets also

respond to incidents of terrorism and thus affect the individuals who were not directly exposed to the terrorist attack. The response of the financial market to terrorism incidents varied across nations and firms also suffered loss due to terrorism indirectly even it was not exposed to terrorism (Lenain *et al.*, 2002; Chen and Siems, 2004).

The political instability was also responsible for fragile conditions that retarded economic growth and inflicted costs to the economic agents. There were many possible sources of political instability and terrorist activities or violent conflicts are the most crucial of sources of political instability. Terrorism negatively affects economic growth through a reduction in capital stock, tourism, human fatalities, and FDI and increased in military and security expenditures while political instability can also be a potential deleterious contributor to the adversity of economic growth due to its link with terror activities [Barro, (1989); Barro and Lee, (1994); Alesina and Perotti, (1996); Aisen and Veiga, (2011)]. Political instability mainly due to violent political unrest adversely affects investment in the cross section. Aisen and Veiga, (2011) also examined the possible channels of negative effects on economic growth due to political instability and concluded that instability mainly distorts the human and physical capital stock accumulation and lower productivity rate.

The economic understanding of violent conflicts and the documentation of their adverse effects immensely evolved in the post 9/11 era, but some of the major cross country literature had quantified implications for overall growth (Knight *et al.*, 1996; de Melo *et al.*, 1996; Collier, 1999). They had quantified the adverse effects of overall growth, infrastructure devastation and the damage as well as reduction of physical capital due to changes in GDP composition, and found substantial negative effects of violent conflict. Moreover, these studies also examined the post conflict behaviour of

the economy and concluded that affected economies received significant “peace dividend” with the end of the conflict.

The post 9/11 world has a strong narrative against terrorism and literature for the investigation of the negative effects of terrorism has two major dimensions for analysis, country specific and across countries-a panel analysis. Most of the cross country analysis evaluated significant negative effects for a country exposed to terrorist attack [Lenain *et al.* 2002; Murdoch and Sandler, 2002; Hoeffler and Querol, 2003; Blomberg *et al.*, 2004; Gupta *et al.*, 2004; Brath *et al.*, 2006; Gaibullov and Sandler, 2009; Vorsina *et al.*, 2015]. These studies figured out various sectors that potential recipients of adverse consequence of terrorism in the form of human and physical capital destruction, increase in security and government expenditures financed by diverting resources from the productive sector to non-productive sector. They also confirmed the association of a peace dividend in the peace era after the end of violence which was in accordance with the results of Knight *et al.*, (1996); de Melo *et al.*, (1996). While the study of Murdoch and Sandler, 2002 prominent for their investigation of spatial aspects of terrorism and spill over effects of civil war. They found potential short run negative spill over effects and no evidence of long run effects of terrorism.

Some of the studies also segregated the analysis into developed and developing world to observe the comprehensive effects of terrorism in each type of country. The pertinent studies in this arena were Blomberg *et al.*, (2004); Gaibullov and Sandler, 2009, that figured out the results that developing countries had significantly strong negative implications of terrorism as opposed to the developed world. Furthermore, they had also examined the effects of terrorism within a country by accounting for the geographic region and governance structure and argued that these factors played a crucial role in the adversity of the effects of terrorism.

Some of the above mentioned studies also observed the aspect of human loss incurred in violence affect economy and found that human death and fatalities triggered the cost of terrorism (Hoeffler and Querol, 2003; Brath *et al.*, 2006). They argued that terrorism positively influenced human fatalities and child mortality in the countries subject to violence and terrorist attacks. Apart from the direct costs of terrorism and violent conflicts few papers also assessed the indirect effects of terrorism due to variations in transaction cost, risk behaviour and psychology of consumers and investors (Brück and Wickström, 2004; Vorsina *et al.*, 2015). They stated that indirect costs were likely to overweigh the direct cost of terrorism and violent activities.

A vast strand of literature also devoted to the country specific analysis and calculated large sum of total economic cost of terrorism and related conflicts. Their findings were similar to the one prescribed by the panel data analysis that terrorism had potential negative effects of GDP growth, capital formation, and positively influenced human fatalities and losses. Some of the major studies in this arena done by Arunatilake *et al.*, (2001); Lenain *et al.*, (2002); Takay *et al.*, (2007); Ocal and Yildirim, (2010); Serneels and Verpoorten, (2012); Rodriguez, (2016).

The economic cost of conflict was estimated by use of Synthetic Control Analysis (SCM) for the Basque region by Abadie and Gardeazabal, (2003) pioneered in developing and applying this methodology to obtain pure causal effects of violent conflict. They estimated significant growth retarding effects of conflicts compared to the widely used econometric techniques. This case study methodology was considered more appropriate for examining the pure economic consequences of terrorism in the economy. Pertinent studies that used SCM to evaluate the cost of terrorism in pure economic terms in their country of interest, namely Persitz, (2007); Dorsett, (2013);

Matta *et al.*, (2016); Costalli *et al.*, (2017). The study of Costalli *et al.*, (2017) was more extensive as they had estimated cost for the 20 countries that suffered from civil war.

### **2.2.1 Economic Cost: Studies in Pakistan**

The literature regarding the cost of terrorism in economic terms for Pakistan is scant to this date and very small number of studies devoted to examining these costs. The ongoing subsection briefly presents these studies.

The literature relating to economic cost of terrorism in Pakistan is scant and existing research primarily used time series analysis to evaluate the economic cost of terrorism. These studies include Mehmood, (2013); Shahbaz *et al.*, (2013); Raza and Jawaid, (2013); Malik and Zaman, (2013). The empirical findings of these studies suggest that economic growth hampered due to terrorism in Pakistan directly and indirectly through destruction of capital stock, decline in bilateral trade and FDI.

The empirical results calculated by Mehmood, (2013) show that Pakistan suffered a loss of approximately 33% of real GDP due to terrorism during the sample period by comparing it with counterfactual of Pakistan without terrorism. The adverse effect mainly channelled through the fall in worker remittances from abroad and domestic investment which account for a 1% of real per capita GDP. While exports were also significantly negatively related to terrorism and FDI was affected by terrorism, but the effect was found to statistically insignificant. An interesting finding was the adverse effect of terrorism on government findings, which was in sharp contrast to the eminent strand of literature in this arena (Blomberg *et al.*, 2004; Gaibulloev and Sandler, 2009).

Evidence suggests that causality runs from terrorism to tourism and terrorism have a significantly adverse effect on tourism in short run and long run as well (Raza and Jawaid, 2013). This finding lead to conclusion that terrorism may also affect

economic growth and negative effects channelled through reduction in tourism. Moreover, the study of Malik and Zaman, (2013) deviates from the other studies as it showed the influence of various macroeconomic variables on terrorism in the country.

The recent government statistics reveal that economy suffered a loss US\$ 118.31 billion after 9/11 in a post 9/11 world due to terrorism in Pakistan.<sup>3</sup> These costs were estimated on the basis reduced industrial output, decline in exports, capital inflows and tax reduction, compensation to the victims of terrorism, delayed processing of privatization, destruction of infrastructure, rise in security expenditures and increased uncertainty. While it was reported that the economy suffered a loss US\$ 107 billion from September 2001 to March 2015 based on the above mentioned cost determinants. Surprisingly, this cost does not have any measure about human and health cost to the society which have a persistent growth consequences of an economy.

### **2.3 Methodological Review**

The econometric methods used to calculate economic cost of terrorism evolved over the time. Most of the initial work was conducted across countries that used to cross country regression proposed by Solow, (1956) with the supplement of the linear structure of cross country regressions. While a path breaking work by Mankiw *et al.*, (1992) used Solow dynamics to derive standard cross country growth, regression by augmenting the original cross country regression specification with determinants of growth. Based on cross country regression analysis Barro, (1991) concluded that political instability adversely affected economic growth. Cross country regression assumed that all units and all time periods were treated homogeneous, which is one of the major limitations of cross country analysis.

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<sup>3</sup> Source: Economic Survey of Pakistan (2015-16).

The cross country regressions also used lagged dependent variable to account for the endogeneity issue and insignificance of variables that are determinant of economic growth these estimations were subject to the robustness test (Barro, 1991, 1996). Furthermore, fixed and random effects were also introduced in panels to capture the country or region specific characteristics from a large panel of countries; where geography, institutions and policy was controlled by using various instruments [Barro, (1991), (1996); Collier, (1999); Hess, (2003); Blomberg *et al.*, (2004); Barth *et al.*, (2006); Abadie and Gardeazabal, (2008); Gaibulloev and Sandler, (2009)].

Initial studies used OLS estimation technique to obtain effects of civil war in a large set of countries and also used fixed and random effect models to compare the results [Collier, (1999); Hoeffler and Querol, (2003); Bloomberg *et al.*, (2004); Nitsch and Schumacher, (2004); Eldor and Melnick, (2004); Enders *et al.*, (2006); Abadie and Gardeazabal, (2008)]. Enders *et al.*, (2006) focused on the effects of terrorism on the US FDI flows to the large group of countries. While some studies used decade wise average of GDP per capita as a dependent variable to capture the effects of war, but this averaging limits the ability of a model to capture the short run dynamics of growth process apart from the conventional limitations of cross country regressions (Collier, 1999; Hoeffler and Querol, 2003).

One of the major criticisms on cross country growth regression was the inability to yield results in line with growth theory regarding significance of various determinants of economic growth apart from endogeneity. This criticism was answered by a series of papers, notably a work by Judson and Orphanides, (1999) with the use of better instrument in a Panel data to account for country specific institutional, geographic and policy relevance factors. These alterations in the econometric models permitted a new estimation technique, namely Instrumental variable (IV) and generalized method



of moments (GMM). A documented work by Dollar and Kraay, (2003) argued that geography, institution or policy related instrument will lead to yield a weak estimate of IV or GMM because robustness tests were unable to validate these estimates. Keeping in view these studies and concerns Bloomberg *et al.*, (2004); Barth *et al.*, (2006); Aisen and Viegas, (2011) used IV/GMM estimates for their cross country analysis regarding cost to economy due to terrorism, where the work of Aisen and Viegas, (2011) documents indirect effects of conflicts and terrorism on economic growth by using system-GMM to account for endogeneity. Some studies used VAR and structural VAR to evaluate the impact of terrorism on macroeconomic behaviour of economy [Enders and Sandler, (1991); Takay *et al.*, (2007); Mehmood, (2013)]. Structural VAR model was used to address the theoretical inadequacy posed by VAR but major limitation of these models was a short run forecasting or impacts of terrorism on economic growth.

Drakos and Kutan, (2003); Vorisna *et al.*, (2015) employed SUR model for their analysis to examine the effects of terrorism on the variable of interest. This model was considered superior than the VAR model for its timely as well as the delayed effects of violence by using immediate and lagged effects of terror. A vast strand of literature used time series forecasting models to evaluate the impact of terrorism on macroeconomic behavior of economic [Enders *et al.*, (1992); Enders and Sandler, (1996); Raza and Jawaid, (2013); Shahbaz *et al.*, (2013); Malik and Zaman, (2013); Rodriguez, (2016)]. These models include VECM, ARIMA, ARDL and EG co-integration techniques to examine the effects of terrorism on economic growth as well as impacts of various macroeconomic variables on terrorism. The main limitation of these models was their inability to pinpoint the appropriate causal effects.

A new methodology due to Abadie and Gardeazabal, (2003) and Abadie *et al.*, (2010) called Synthetic control method (SCM) evaluated the impact of terrorism

(conflicts) on economic growth of Basque Region. This methodology involved the construction of synthetic Pakistan for our case study from a weighted average of countries-known as control units that have same structural processes as Pakistan but does not suffer from large scale terrorism after the attack of 9/11. The difference between Pakistan and Synthetic Pakistan yielded a measure of economic cost of terrorism in Pakistan as Abadie and Gardeazabal, (2003) estimated in the Basque region. The study found that Basque region incurred a loss of approximately 10 percent of GDP per capita due to conflicts as compared to the synthetic Basque region as it was not exposed to shock. Similarly, Matta *et al.*, (2016) also used SCM to examine the effects of the Arab Spring on Tunisian economy by constructing its counterfactual from a weighted average of countries that were not exposed to Arab spring.

In this study an attempt was made to address the literature gap regarding the economic cost of terrorism in Pakistan with the help of recently developed methodology-Synthetic Control Method (SCM). The use of SCM accounted for weaknesses associated with the cross country estimates while time varying unobservable confounding factors vary over time as opposed to the assumption of Mill's difference in difference model.

This methodology addresses the two major shortcomings associated with the previous models in terms of endogeneity and failure of cross country growth regressions. Countries qualify for the donor pool if they have the structure and growth processes similar to the treated country. This feature of the methodology is the major deviation from the past studies used to calculate the economic cost of terrorism as well as standard cross country regression analysis. The selection of various countries allowed and helped to develop a synthetic Pakistan, which shows what would happen to income per capita of a citizen if the country did not face severe attacks of terrorism

by comparing it with actual GDP per capita of Pakistan in post 9/11 era. This methodology does not allow the extrapolation biases that generate an inference from hidden parameters. Moreover, it also accounts for endogeneity caused by omitted variable bias with flexibility, granting to time invariant unobservable confounders to vary over time.

## CHAPTER 3

### THEORETICAL FRAMEWORK

#### 3.1 Theoretical Background

This section briefly presents the theoretical background regarding the economic consequences of terrorism. Various economic theorists devised a different framework to explore the terror effects of economic growth due to the fact that terrorism affects economic growth through various channels.

Economic theory predicts potential negative association of economic growth with terrorism and violent conflicts, where violence hampered economic growth through various channels [Keynes, (1936); Isham *et al.*, (1996); Knight *et al.*, (1996); Collier, (1999); Eckstein and Tsiddon, (2004); Mirza and Verdier, (2007); Frey *et al.*, (2007)]. The foremost effect of terrorism or civil war is the infrastructure and human capital destruction due to fatalities, while infrastructure destruction occurs in terms of loss to public or private property. Secondly, terrorism also negatively affects the social fabric of society and these activities accelerate the social disorder and public expenditures are used to maintain social order as argued by Isham *et al.*, (1996). Knight *et al.*, (1996) suggested that economic growth retarded due to the diversion of resources from output enhancing activities to security expenditures. They stated that the rise in security expenditures increases army power and deteriorates state of rule of law and property rights. Moreover, the economy subject to terrorism faces a reduction in savings due to loss of income caused by terrorism, which further limits the process of capital accumulation. Collier, (1999) points out the portfolio substitution effect of terrorism in terms of flight of capital both financial and physical.

One of most plausible theoretical support for the adverse effects of terrorism on investment in a country subject to terrorism obtained from Keynesian theory.<sup>4</sup> This theory suggests that Investment decision crucially depends upon the business expectations rather than interest rates and business expectations directly affected by overall security environment in the economy. The climate of fear and violence posed by terrorist rapidly deteriorate the business expectations and thus reduces investment in the economy. Similarly, as the terrorism erodes the security and peace of a country, it also thwarts the inflow of assets and capital from abroad due to the more vulnerability to terrorist attack (Czinkota *et al.*,2010).

Terrorism and activities of violence depress the investment in various sectors of the economy and also roll back the “peace dividend” associated with the peacetime due to increase in military expenditures (Fielding, 2003). These activities were channelled through the introduction of political instability and unrest in the society. A theory presented by Eckstein and Tsiddon, (2004) suggests that terrorism affects the aggregate economy as the government put up security expenditure mainly financed by tax revenues. The use of defence spending in some output generating activity (production of security related products) will offset the negative effect to some extent but will be unable to banish it completely. Terrorism reduces the future life value relative to current which results in dissaving in economic and investment falls that limit consumption and income growth in the long run.

Mirza and Verdier, (2007) devised a theoretical framework to explore the transnational terrorism effects on international trade and concluded that bilateral trade adversely affected due to incidence of transnational terrorism. Frey *et al.*, (2007) developed a theoretical framework based on the life satisfaction approach to measure

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<sup>4</sup> Source: General Theory of Employment, Interest and Money (1936).

the impact of Conflicts of Northern Ireland. They identified that individual faces a huge reduction in life satisfaction due to terrorist activities and sacrifice a major portion of their utility due to exposure to terrorism.

# CHAPTER 4

## DATA AND METHODOLOGY

### 4.1 Introduction

In this section I will elaborate the data and variables used in the study and also describe the methodology use to support the objective of the study. The section is further divided into two subsections; the subsection 4.1 supplements the detail of variables that we will use in the study while subsection 4.2 outlines the synthetic control method.

### 4.2 Data

The data of this study will cover economic and terrorist phenomenon to facilitate the investigation of study. The present study will use standard set of macroeconomic and structural variables to capture the growth and structural dynamics of Pakistan and countries in the donor pool.<sup>5</sup>

The structural variables include a value added share of agriculture (percent of GDP), value added share of industry (percent of GDP), and value added share of services (percent of GDP). These variables will try to ensure the structural similarity of Pakistan with the countries in a donor pool. The data for macroeconomic variables namely GDP per capita PPPs (constant 2011 international \$) as a dependant variable in the first specification, While the independent variables are three structural variables mentioned above, Gross capital formation (percent of GDP) as a proxy for investment share of GDP, Export and import of goods and services (percent of GDP) used to capture the trade openness position of nations. Moreover, the Household final consumption expenditure, etc. (% of GDP) and General government final consumption

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<sup>5</sup> Source: see Barro (1996); Barro and Sala-i-Martin (1995).

expenditure (% of GDP) as proxies for aggregate private and government consumption respectively. The additional explanatory variables include life expectancy at birth (total years), Secondary School enrolment (gross percentage), population density (people per square km of land area), and Energy use (kg of oil equivalent) per \$1,000 GDP. The inclusion of Energy use as an explanatory variable is a crucial step toward controlling a widely discussed issue of ongoing energy crisis in the Pakistan started roughly in 2007. The usage of energy use as a control variable raises the strength of the analysis by facilitating the process in search of pure causal effect of terrorism in Pakistan.

The second specification used Gross Capital formation (percent of GDP) as dependent variable while the investment predictors are Broad money (% of GDP), Domestic credit to the private sector (percent of GDP) as a proxy for financial development, GDP per capita, PPP, and index of Political Stability which is most crucial for investment decisions. The last specification also used Gross capital formation, Broad money, GDP per capita, PPP, index of Political Stability, index of rule of law, Trade (percent of GDP) and natural resources as explanatory variables and foreign direct investment, net inflows (percent of GDP) as a dependent variable. All the variables are obtained from World Bank data source known as World Development Indicators except the index of rule of law and political stability used from dataset of freedom house.

While the data for terrorist attacks was used to observe the wave of terrorism across countries which helped to sort out countries that did not face terrorism as a large scale phenomenon for the potential donor pool. The definition of variables and the source of data are provided in the table in appendix. Moreover, the descriptive statistics of terrorist attack in Pakistan also presented in table A2 in appendix.



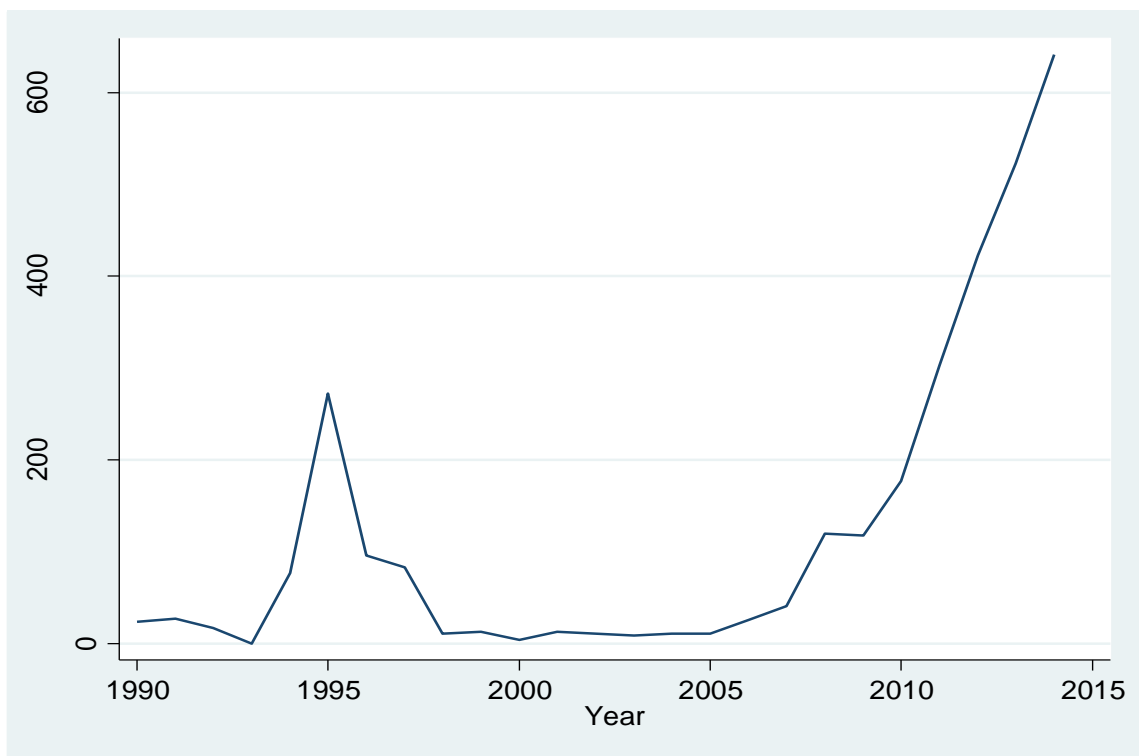
### 4.3 Synthetic Control Method

The Synthetic Control Method is a technique devised to obtain a causal effect of any event of interest with this purely data driven procedure. Comparative case studies are most prominent type of inquiries for obtaining the causal effect of any occurring event on the variable of interest. Synthetic Control Method (SCM) allows the researcher to rigorously analyse the impacts of specific events on the variable of interest by comparing it with its synthetic counterpart. It is the synthetic counterpart that lies at the heart of this methodology as this whole method is exercised to develop a suitable synthetic counterpart for treated unit. There are three core assumptions; a): none of the country in donor pool has experienced a massive terrorist attack after 9/11, b): number of pre-treatment years should be large enough to control the biases arise from unobservable variables, c): the exogenous shock due to massive terrorist attacks in treated unit has no impact on the variable of interest of units in the donor pool.

The construction of the synthetic control unit starts with the selection of various countries for the donor pool which will help us to obtain a control unit. The donor pool contains various countries not suffered from the occurrence of events of interest, but possesses the properties similar to the treated unit. The donor pool consists of countries that have the similar structural processes and determinants of economic growth that closely reflect the characteristics of the treated unit (Pakistan). The time period is segregated into two; the pre-terrorism era  $T_0$  which starts from 1990 and ends at 2006 while the terrorism era  $T_1$  contain year from 2007 to 2014. The choice of 2007 to be the start of post-treatment period is based on the statistics provided in Global Terrorism Databases of the Pakistan. The statistics show that country face a sudden surge in the terrorist attacks and terrorism became a countrywide phenomenon (see Figure 4.1).

Implicit here is the assumption that synthetic Pakistan approximately replicates the characteristics of the Pakistan in the pre-terrorism era and the economic growth of units present in the donor pool are not subject to structural shock in the period under discussion. Suppose we have  $N + 1$  countries where  $n = 1$  is Pakistan (the treated unit) and  $2 \leq n \leq N + 1$  are the countries in the donor pool which are potential comparison units.

**Figure 4.1: Number of Terrorist Attacks over the Sample period**



Source: Global Terrorism Databases, 2017.

The synthetic control method is applied to obtain a Synthetic Pakistan that replicates the economic growth of Pakistan in a fairly good approximation. The construction of synthetic Pakistan accounts for the fact that none of individual country can resemble the dynamic of economic growth of Pakistan solely but did not face a surge in terrorist attacks. This process starts with the construction of weighted average of control from a convex hull of countries in a donor pool by selecting a suitable weight with the use of the synthetic control method in order to account for the fact that a single

country cannot be used as a control unit. These weights will be denoted by the vector  $W = (w_1, w_2, \dots, w_N)$ , where  $(0 < w < 1)$  for all  $n \geq 2$ , and  $(\sum w = 1)$ . The column vector  $X_1$  shows various weights given to countries in a synthetic Pakistan, which in turn will be compared to Pakistan (treated unit) for post terrorism era in order to obtain a causal effect of the surge in terrorism on economic growth of Pakistan.

The counter-factual methodology is the generalization of Mill's difference-in-difference model (fixed effect) except the relaxation of the assumption that unobserved individual specific effects are constant over time. Abadie *et al.*, (2015) suggest that the value of  $W$  should be such that the characteristics of synthetic Pakistan are the best replication of the actual Pakistan's characteristics. Suppose  $X_1$  is  $(ix1)$  vector of values of pre-terrorism characteristics (macroeconomic growth predictors) of Pakistan while  $X_0$  is  $(ixN)$  matrix of same variables of pre-terrorism era from the donor pool for the units. The objective is to minimize the difference between  $X_1$  and  $X_0W$  by selecting optimal weights ( $W$ ) and this difference is given by  $(X_1 - X_0W)$  which shows the pre-terrorism discrepancy between Pakistan and Synthetic Pakistan. These  $W^*$  are thus chosen to minimize

$$W^* = \underset{W}{\operatorname{argmin}} [X_1 - X_0W]'V[X_1 - X_0W] \quad (1)$$

Subject to

$V$  is a  $(ixi)$  matrix containing the weights given to each predictor relative to its importance in optimizing equation (1).

$V$  is a diagonal matrix with nonnegative entries and its choice affects  $W^*$ . The appropriate way is to assign higher weights to the predictor that has a higher influence on the economic growth of Pakistan. Abadie and Gardeazabal, (2003) suggest the technique of selecting  $V^*$  in such a way that the economic growth of synthetic control

unit effectively resembles the economic growth of Pakistan in the pre-terrorism era.

Formally,  $V^*$  is defined by

$$V^* = \underset{V}{\operatorname{argmin}} [Y_1 - Y_0 W^*(v)]' [Y_1 - Y_0 W^*(v)] \quad (2)$$

where  $V$  contain set of diagonal matrices ( $i \times i$ ) with nonnegative weights. The matrix  $Y_1$  is a column vector ( $T_0 \times 1$ ) consisting upon the values of economic growth over the pre-terrorism period of Pakistan. While the  $Y_0$  is the matrix ( $T_0 \times N$ ) containing the values of economic growth over the pre-terrorism period for the donor pool.

Finally, the last step of this procedure is to recover a causal effect of terrorism (the treatment effect) on the economic growth of Pakistan (treated unit). This recovery is initiated by defining the vector  $Z_1$  ( $T_1 \times 1$ ) consisting of the post terrorism economic growth values of Pakistan and  $Z_0$  ( $T_1 \times N$ ) as a matrix of post terrorism economic growth values of donor pool. The comparison of economic growth of the treated country (Pakistan) and the economic growth of synthetic counterpart (control unit) will give us the impact of terrorism on the economic growth of the treated country (Pakistan) in the post terrorism period. Moreover, it can be formally defined as

$$\text{Causal effect} = (Z_1 - Z_1^*), \quad \text{where } Z_1^* = W^* Z_0.$$

## CHAPTER 5

### RESULT AND DISCUSSION

#### 5.1 Introduction

This section presents the results and major findings of the study and discussion the relevance of the findings. Subsection 5.1 present the results of economic cost of terrorism in Pakistan; subsection 5.2 and 5.3 following 5.1 outline the findings of Falsification and Robustness test. The last subsection 5.4 outline the potential channels of the economic cost of terrorism and also conclude this section.

#### 5.2 Results

The Synthetic counterfactual is constructed as a weighted average of ten countries from a list of forty nine countries finally qualified for the donor pool. Senegal, Benin, Ecuador, Bangladesh, and Congo Democratic Republic received higher weights accordingly in the construction of Synthetic Pakistan (Synthetic control unit or Synthetic counterfactual). The detail of respective country weights is provided in Table 5.1. The country weights reflect the fact that countries that possess more structural similarity to Pakistan have received higher weights based on the various macroeconomic and structural matching criteria (macroeconomic and structural variables).

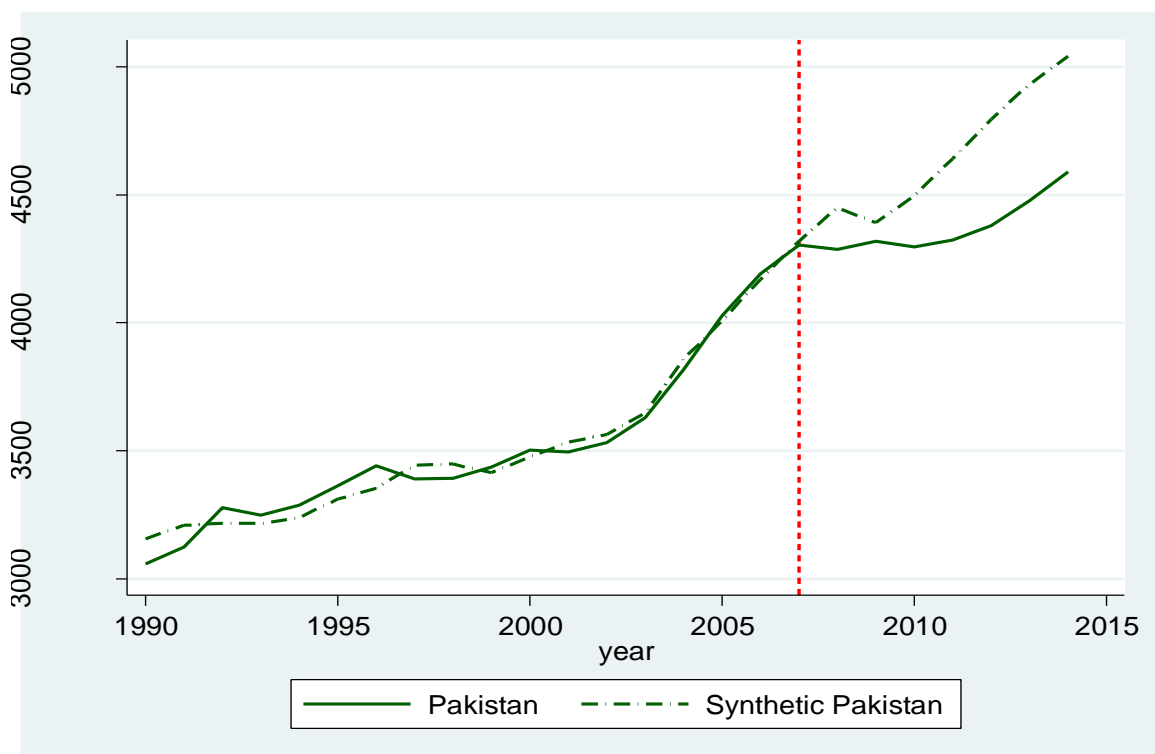
**Table 5.1: Synthetic Weights of countries in Control Unit (Synthetic Pakistan)**

Sr. No	Control Units	Weights (W*)
1	Bangladesh	0.141
2	Benin	0.191
3	Chile	0.001
4	Congo. Democratic Republic	0.116
5	Ecuador	0.149
6	India	0.067
7	Malaysia	0.031
8	Senegal	0.267
9	Trinidad and Tobago	0.014
10	Venezuela	0.022

**Source:** Author's calculation.

The intuition to develop a counterfactual of Pakistan is to thoroughly examine the implication of severe shock of terrorism occurred in near past in the country (started in next half of first decade of 2000s). As we cannot go back in time and investigate the real time consequences for the economy, I have constructed the counterfactual of Pakistan with the help of ten countries that are structurally similar to Pakistan in terms of growth processes. The GDP per capita is used as a criteria to capture the economic wellbeing of Pakistan. Synthetic Pakistan (SP) is constructed from a convex hull of countries based on the similarities in terms of growth process of actual Pakistan. Figure 5.1 depicts the growth processes of actual and Synthetic Pakistan accordingly to provide a visual comparison.

**Figure 5.1: GDP per capita of Pakistan and Synthetic Pakistan**



Source: Author's calculation.

The GDP of actual and Synthetic Pakistan portrayed a similar trend starting from 1990 to 2006, which is termed as the pre-treatment period (pre-terrorism era).<sup>6</sup> The exposition of GDP per capita of Synthetic Pakistan (a dashed line in figure 5.1) provides a best replication of pre-treatment characteristics of actual Pakistan. This exposition of per capita GDP of Synthetic Pakistan before 2007 allowed us to infer a pure causal effect of surge in terrorism in Pakistan in the year 2007. The adverse effect of terrorism in Pakistan can be tracked by comparing post-treatment (i-e; post-terrorism period) per capita GDP of Pakistan with the per capita GDP of its Synthetic counterpart. The estimated causal negative effects of terrorism for economic growth of Pakistan are reconciled with the existing literature related to Growth-Conflict nexus [Abadie and Gardeazabal, (2003); Persitz, (2007); Dorsett, (2013); Matta *et al.*, (2016); Costalli *et al.*, (2017)].

**Table 5.2:** Average of Growth Predictor of Pakistan, Synthetic Pakistan and Donor Pool

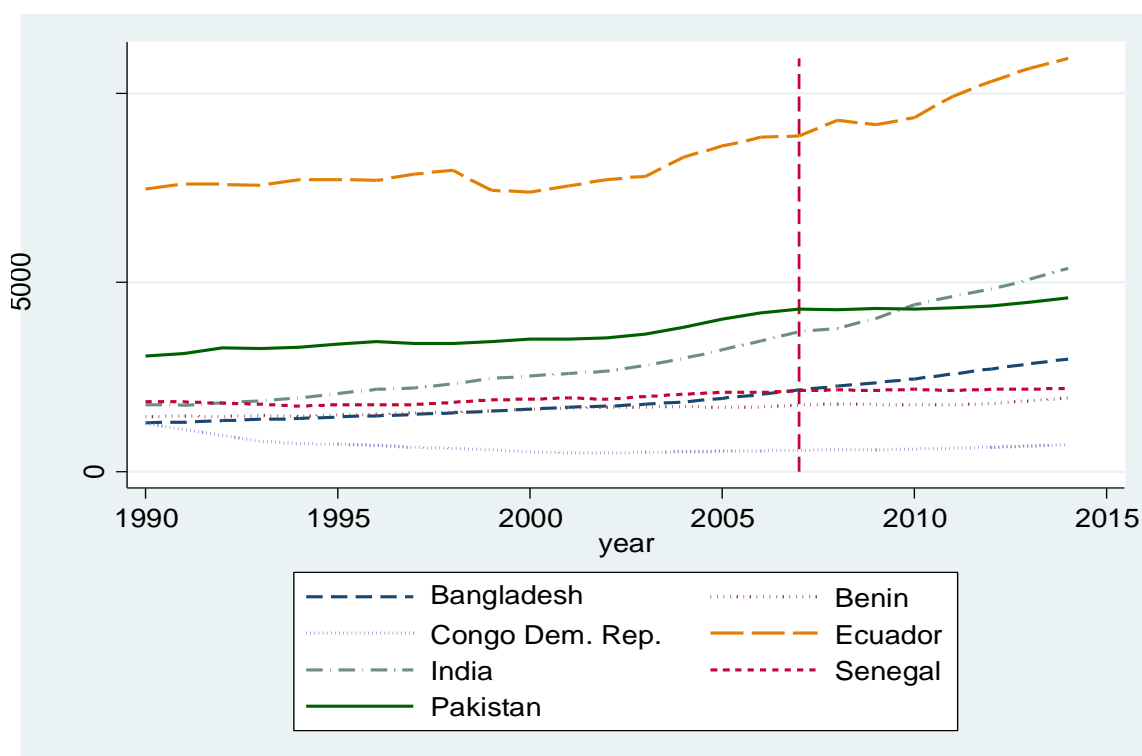
Predictors	Pakistan	Synthetic Pakistan	Donor Pool
Agriculture value added share	24.98289	23.52272	14.83941
Services value added share	50.67643	50.32034	52.59661
Industry value added share	24.34068	26.05688	32.57209
Household Consumption (% of GDP)	73.66639	74.44146	66.29022
Government Consumption (% of GDP)	10.93565	11.29739	14.34642
Gross Capital Formation (% of GDP)	18.22681	18.82428	23.16471
Life Expectancy at Birth	62.20685	60.64336	68.05442
Secondary School Enrolment Gross	26.06029	34.89329	71.43089
Export of goods and services (% of GDP)	15.85592	24.29434	40.67085
Import of goods and services (% of GDP)	18.68476	28.95748	44.4722
Population Density	171.1964	199.1179	143.6204
Energy Use per capita GDP	129.355	176.4426	173.3805
GDP per capita (1990-1994)	3198.503	3206.945	9816.504
GDP per capita (1995-1999)	3404.643	3393.874	10386.15
GDP per capita (2000-2004)	3595.135	3615.359	11701.12
GDP per capita (2005-2006)	4109.042	4087.659	13098.65

**Source:** Author's calculation and WDI (2017).

<sup>6</sup> The detail of pre-treatment and post-treatment period selection is provided in Chapter 4.

Table 5.2 enlists the descriptive statistics of the structural and macroeconomic growth predictors used for the construction of Synthetic Control Unit (Synthetic Pakistan). The average of growth predictors of Synthetic control unit and Donor Pool provides insight about the counterfactual of Pakistan and supports our argument for Synthetic Pakistan as a best replication of actual Pakistan during pre-treatment period. Column 2 of Table 5.2 provides an average of growth predictors of Synthetic Pakistan, which shows that it is more analogous to actual Pakistan in almost all matching variables. On the other hand, the comparison of column 1 with column 3 reveals that using the entire donor pool as a counterfactual of Pakistan is not a viable and optimal choice. The Synthetic Pakistan is a fair replication of actual Pakistan in the pre-treatment period; constructed on the basis of various macroeconomic growth predictors mentioned in the Table 5.2.

**Figure 5.2: GDP per capita of Pakistan and Selected countries from Synthetic Pakistan**



Source: WDI (2017).



The Synthetic counterpart of Pakistan closely approximates the pre-treatment characteristics of Pakistan in almost all growth predictors. The Synthetic Control Method (SCM) is the variant of Mill's Difference-in-Difference (DiD) methodology in terms of granting the permission to time invariant confounding factors to vary over time as compared to DiD. The SCM also satisfies the "similar trend" assumption of DiD by selecting countries from a donor pool that depicts the similar trend in terms of variable of interest (GDP per capita). To check the validity of this assumption I have plotted the per capita GDP of control countries with positive weights in construction of counterfactual.

In Figure 5.2, line graph of six countries out of ten control units (six units receives more than 93 percent of the weights in the development of SP) are plotted along with per capita GDP of treated unit to compare each unit's trend with the GDP per capita of the treated unit.<sup>7</sup> It is apparent in the graph that the control countries and treated country depicts similar per capita growth trend over the sample period. This graph confirms the validity of "similar trend" assumption of SCM and bolster the argument for the Synthetic Pakistan as a suitable counterfactual of Pakistan.

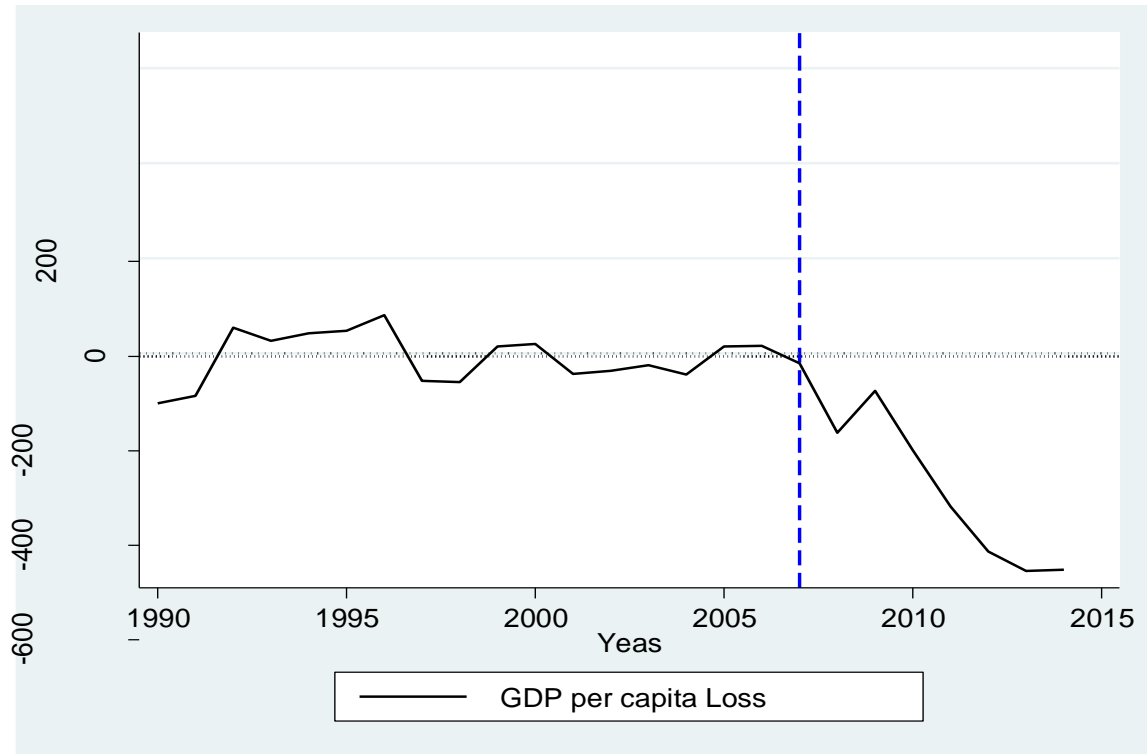
Once we obtain a suitable counterfactual for the country of interest, then it can be compared with the treated unit to recover the causal effect for our event of interest. As mentioned earlier in Figure 5.1 that the causal negative effect of terrorism in Pakistan can be obtained by comparing GDP per capita path of actual Pakistan with Synthetic Pakistan from 2007 to 2014, and also graphed in Figure 5.3 as well. Formally, it is defined as

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<sup>7</sup> The plot of only six countries is used to provide a better visual comparison among the control units and Pakistan while the plot of entire countries in the Synthetic control unit is given Appendix as AG.

$$\text{Causal effect of terrorism} = (GDP_{Pak,T_1} - GDP_{Synth,T_1}) \quad \text{where } T_1 = 2007, \dots, 2014.$$

**Figure 5.3: Gap in GDP per capita of Pakistan and Synthetic Pakistan**



**Source:** Author’s calculation.

The Post treatment period ( $T_1$ ) begins in 2007 and ends in 2014; the rationale behind restricting our sample to 2014 is that a countrywide operation was launched against terrorist immediately after the attack of APS Peshawar.<sup>8</sup> Table 5.3 documents the yield of the comparison of the two above mentioned matrices.

It is apparent from column 2 of Table 5.3 that the per capita GDP loss escalates over time as the number of terrorist attacks (see column 4) rapidly increased in the Pakistan. This loss is estimated to be 15 dollars per person in 2007, which stands at less than one percent of the GDP per capita. This loss faced a dramatic surge and reached

<sup>8</sup> National Action Plan was launched by Government of Pakistan in early 2015.

to 452 dollars per capita in 2014; which account for more than nine percent of GDP per capita in the same year.

**Table 5.3: Causal negative effect of terrorism on GDP of Pakistan**

Years	GDP per capita loss	Loss (% of GDP, PPP international \$)	No. of Attacks
2007	15.02804	0.349205	41
2008	161.6635	3.770681	120
2009	73.10914	1.693073	118
2010	198.8008	4.626919	177
2011	318.1212	7.3596	303
2012	413.3013	9.435592	423
2013	454.8335	10.15956	523
2014	451.9001	9.848234	641

**Source:** Author's calculation.

The results reveal that each citizen bear a loss of 260 dollar on average during 2007-14, which accounts for 6 percent of GDP per capita in the post treatment period due to terrorism.

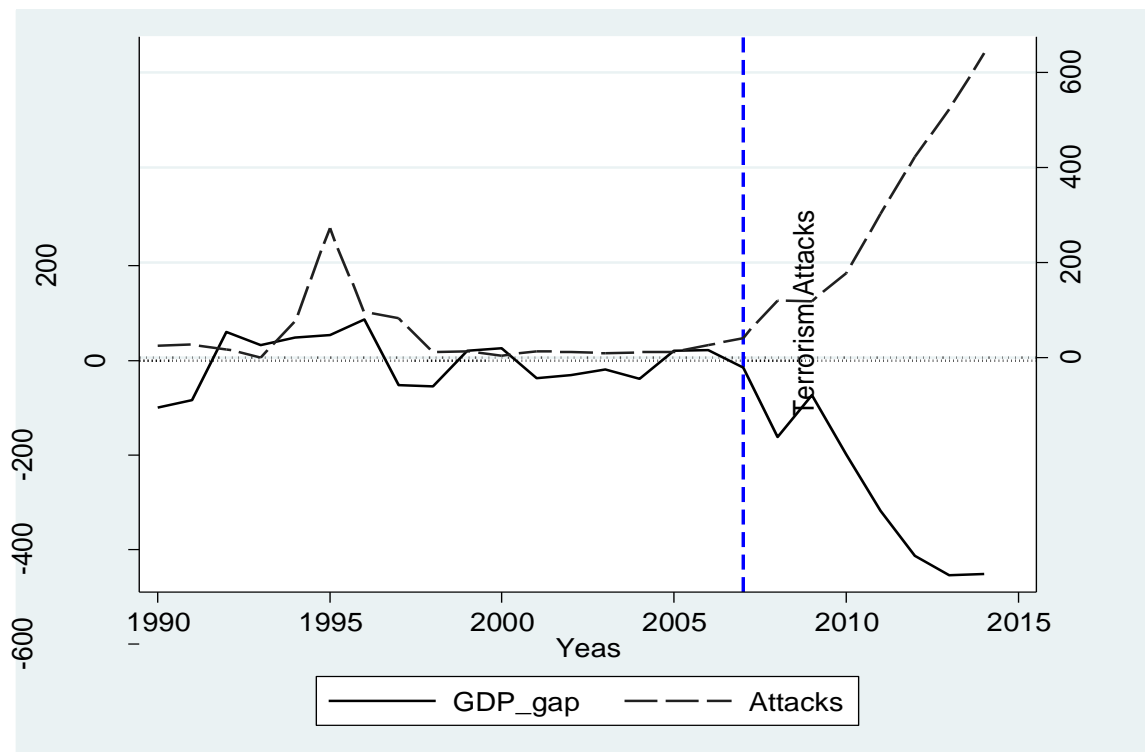
It is important to mention that the activities of violence and terrorism are not completely attributed to the incidence of September 11, 2001. One of the crucial factors in these activities was their confined spatial aspect. A closer look at Global Terrorism Database (2017) reveals that significant number of terrorist and violent activities of violence and terrorism were confined to particular areas of the country.<sup>9</sup> In the post September 11 period till 2007, the new form of activities were started in the country which were also termed as terrorism but these activities were also limited to specific regions in the country. In 2007, the incident of terrorism became a countrywide phenomenon and the spill-over of terrorism in Pakistan also lead to exacerbate the overall security environment in the country. Moreover, the situation of security further

<sup>9</sup> For detail of pre 9/11 violence activities see Saeed *et al.*, (2013)

deteriorated as the activity of terrorism spread in a country and wide cross section of the society was also targeted in addition to security and government officials.<sup>10</sup>

To articulate the post-treatment (terrorism) period selection and strengthen the argument for 2007 to be the starting point of terrorism activity in Pakistan, Figure 4 provides a brief comparison of terrorist activities measured in terms of number of attacks and GDP per capita gap between actual and Synthetic Pakistan over the whole sample period. The solid line is the estimated GDP per capita loss due to terrorism (which was also mentioned in figure 5.1 and figure 5.3 as well) and dashed line shows number of Attacks in Pakistan over the whole sample period.

**Figure 5.4: Comparison of GDP per capita loss and Terrorism Activity**



**Source:** Global Terrorism Database (2017) and Author's calculation.

For expositional purpose, it is shown that the number of attacks in the country, on average remained close to 20 attacks per year during pre-treatment era of sample study except in 1994 to 1997 when country faced 132 attacks on average due to ethnic

<sup>10</sup> For more detail visit Global Terrorism Databases, (2017)

and political violence in Karachi. It is this pre-treatment period characteristic that may be associated with the negative GDP per capita gap in Pakistan before 2007. The graph outlined a vertical dash line in 2007 as an indication for the post-terrorism period in Pakistan which can be confirmed from a steeped dashed line showing rising number of terrorism attacks. Additionally, this increased terrorism in Pakistan hampered economic growth and inflicted a causal negative effect; which is depicted the downward sloped solid line in graph 5.4, immediately after 2006.

### **5.3 Falsification Test**

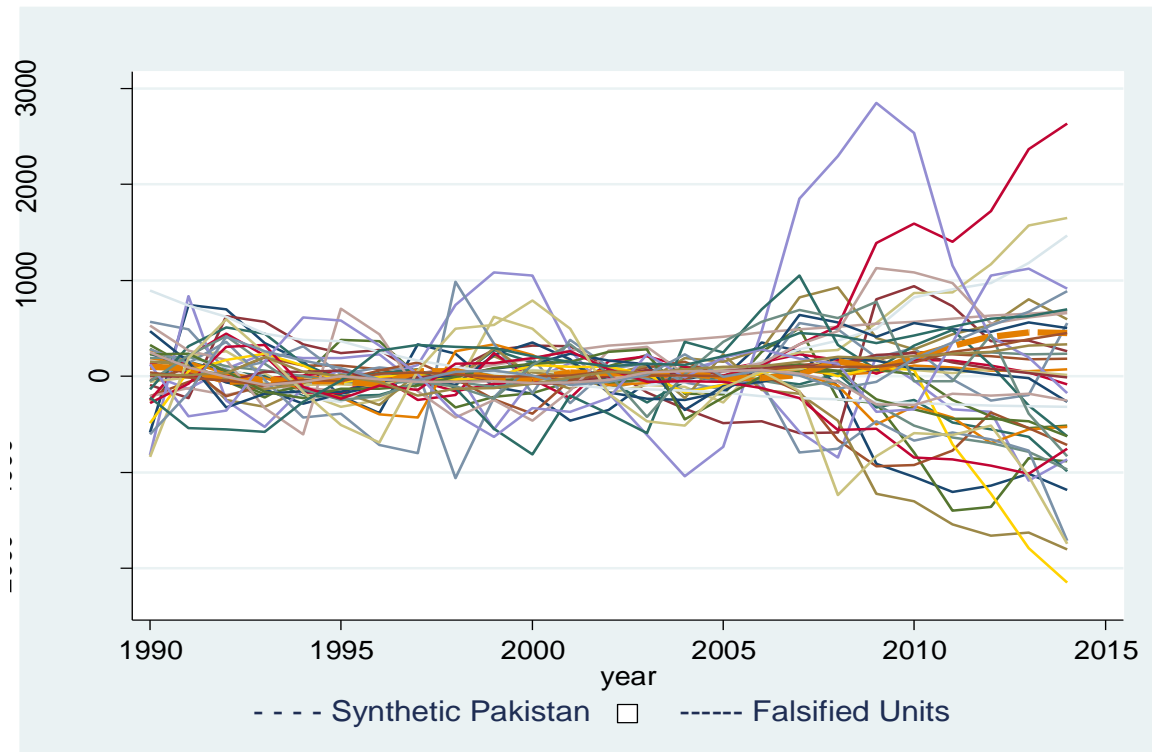
The causal negative effects to the GDP per capita of Pakistan are associated to terrorism in the country, which was accelerated with full intensity in 2007. The findings of the inquiry are consistent with the vast strand of literature regarding growth and violence nexus [Knight *et al.*, (1996); de Melo *et al.*, (1996); Collier, (1999)]. The results of the model are further examined by applying various diagnostic tests, which leads to provide support for the validity and reliability of the findings. For this purpose, I have applied a Falsification/Placebo tests as discussed below.

#### **5.3.1 Falsified Treatment of Untreated Units**

One of the widely used falsification test for the assessment of causal effect of any event of interest is Placebo test, which I have applied to analyse the validity of the results. The test started with the false assignment of terrorism treatment to each and every unit (country) listed in donor pool except in the case of Pakistan which was actually exposed to the treatment. The intuition of false assignment of treatment to the untreated unit is that it substantiate and confirm the absence of exogenously driven results for our treated unit (Pakistan) by depicting a dissimilar pre and post treatment behaviour.

Ideally each arbitrary country assigned to be treated falsely should replicate the similar pre and post treatment characteristics by Synthetic control unit for actual unit. In Figure 5.5, the graphical visualization of the placebo in space assigned to entire donor pool and for our treated unit (Pakistan) are presented.

**Figure 5.5: Placebo test**

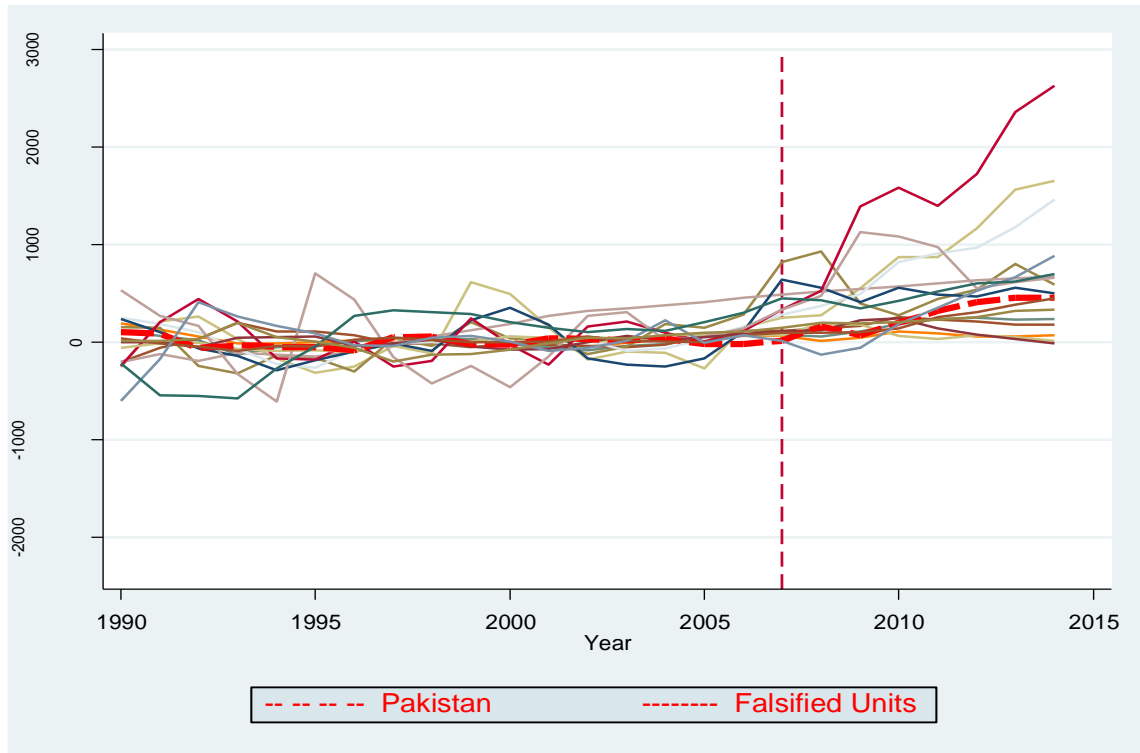


**Source:** Author's calculation.

These results does not provide any insight about validity of results in first glance due to cluster of too many units in one graph. The closer examination of the graph reveal that the countries that exhibits a positive gap in GDP per capita (negative loss of GDP per capita) also have a divergent path of GDP in pre-treatment period as well.

In order to make it more concrete and visible I have eliminated the countries for whom the placebo assignment yield negative gap (the positive effect of terrorism on GDP per capita) in post treatment period. Such placebo results are not relevant for the current study and the unit for which negative gap observed are excluded from the graph to make it clearer (see Figure 5.6).

**Figure 5.6: Placebo tests (Omitting countries with positive effects of terrorism)**



**Source:** Author's calculation.

This graph clearly indicates that none of the placebo assigned units replicates the results similar to the Synthetic control unit constructed for Pakistan. Although, the countries have negative effects of terrorism but an important distinction is that these negative effects cannot be associated to the incidence of terrorism which became a common phenomenon in 2007 and onward. As a matter of fact, the units with negative effects of terrorism does not replicate the pre-terrorism characteristics of actual units as they deviated from the zero line, and provide a support for the findings of this inquiry. The placebo tests confirms that the causal negative effects of terrorism was driven purely by chance and may be associated with the incidence of terrorism in Pakistan which was started in the same time period.

#### **5.4 Robustness Test**

The sensitivity of the estimated results is then analysed by changing the year of treatment year and donor pool of countries which helped in constructing the Synthetic

Pakistan by dropping/omitting a country with positive weight for Synthetic Control Pakistan. The sensitivity of result is also examined by setting an arbitrary year as a start of treatment period. The intuition of omission of country with a positive weight provide an insight about the results driven by a specific country and ensure that by dropping any unit with high weight does not alter the path of Synthetic Pakistan significantly. These sensitivity tests are discussed below.

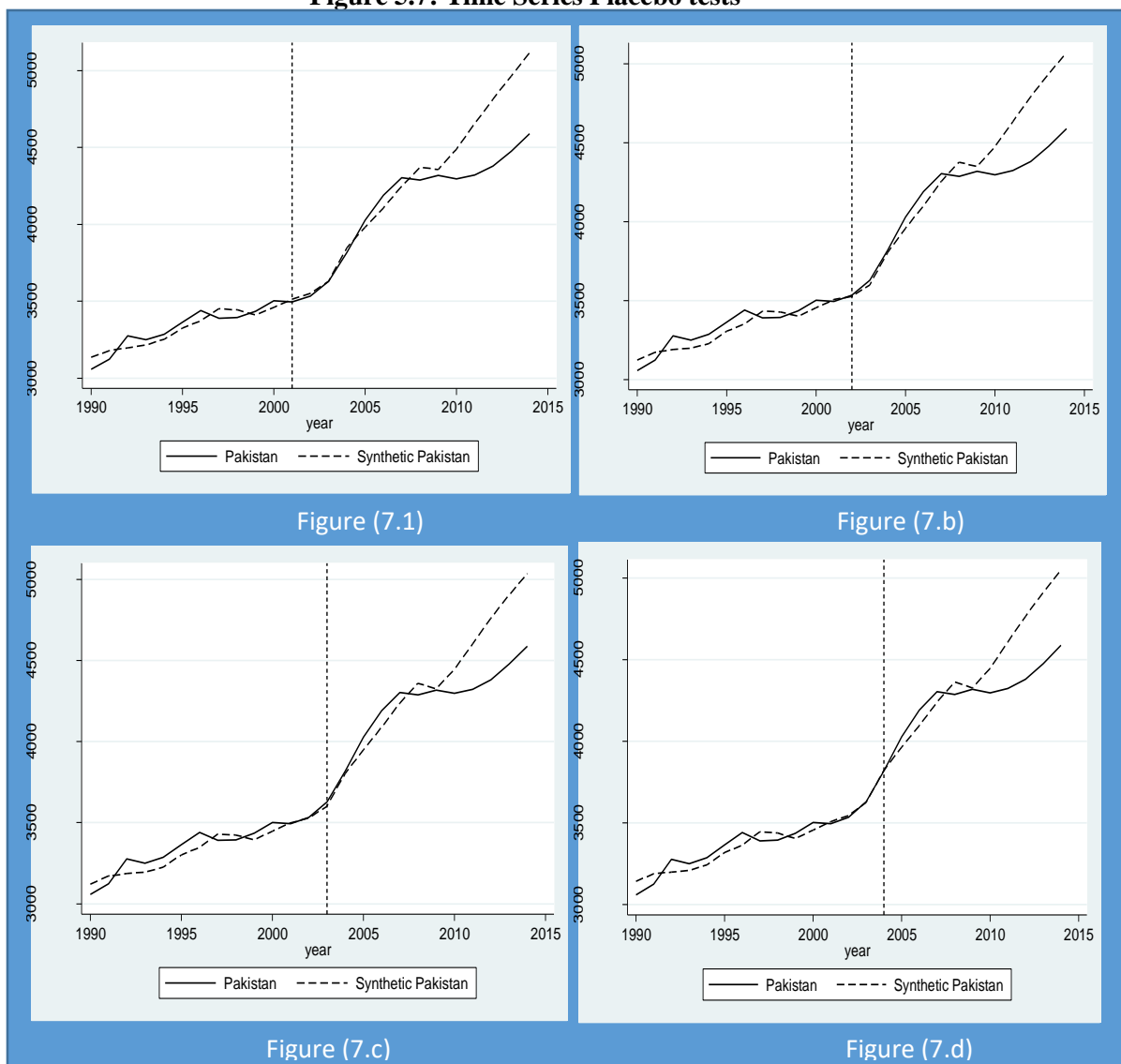
#### **5.4.1 Placebo Time Series Test**

To ensure the robustness of the causal negative effects of terrorism on GDP per capita of Pakistan can be confirmed by the introduction of treatment period prior to the actual time of treatment. I have introduced terrorism treatment in 2001, 2002, 2003 and 2004 consecutively and found no major deviation of actual GDP per capita of from its Synthetic control unit immediately after the treatment period.

Figure 5.7 contain four graphs which differ only in term of treatment year; where figure (a)-(d) shows treatment year from 2001 to 2004 respectively. Each graph highlights that GDP per capita of actual and Synthetic Pakistan have not diverged immediately after the treatment period (post-terrorism era) and confirms the reliability of estimated results of the inquiry. The results of the falsification and robustness tests corroborate the findings of study and set ground to bolster the outcome of the model.



**Figure 5.7: Time Series Placebo tests**



**Source:** Author's calculation.

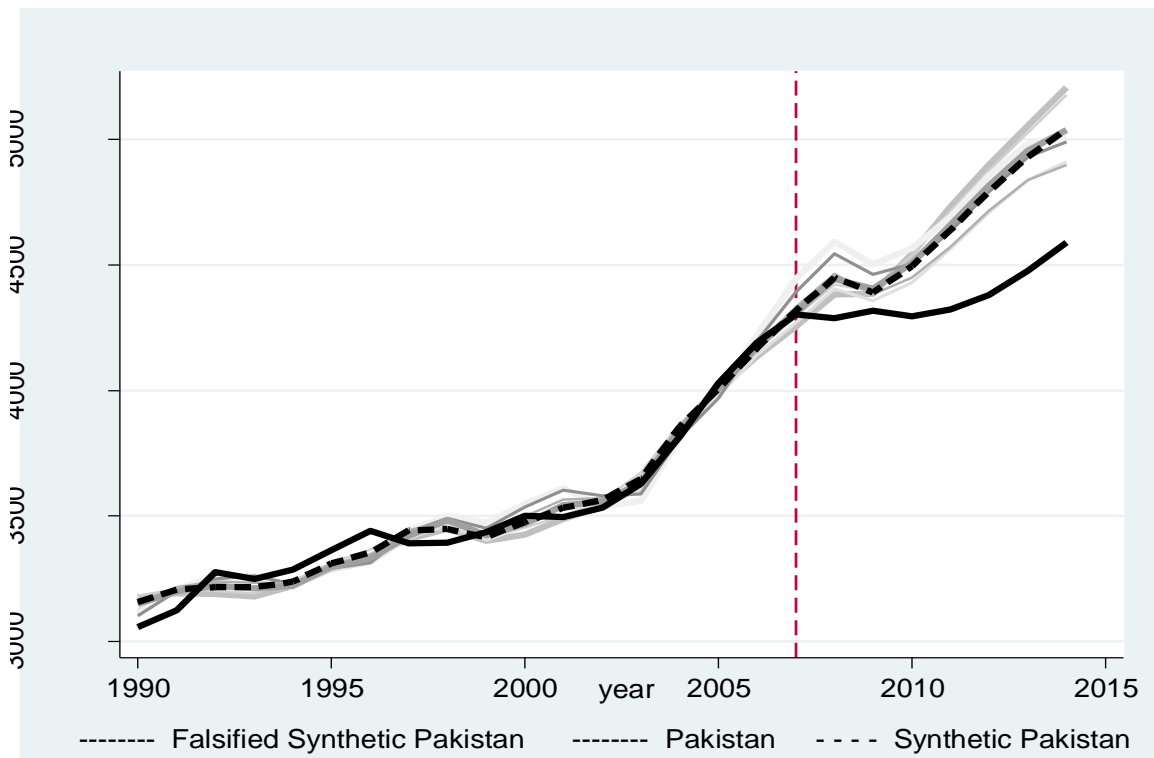
### 5.4.2 Sensitivity Analysis

Figure 8 exhibits the visual outcome of the sensitivity analysis conducted by dropping a country at a time with a positive weight. The test started by dropping a country that received the highest weight in the donor pool and then I ran the Synthetic model to obtain a Falsified Synthetic Pakistan (the different grey lines indicates Falsified Synthetic Pakistan). Similarly, I have retrieve the omitted country and dropped the next country to obtain another Falsified Synthetic Pakistan. The analysis proceeds in this manner for all the countries in actual Synthetic group and the resultant Falsified

Synthetic Pakistan along with actual Synthetic Pakistan is plotted in the graph (Figure 5.8). The solid line represent GDP per capita path of actual Pakistan; the dashed line represent per capita path of Synthetic Pakistan while the grey lines depicts the GDP per capita of Falsified Synthetic Pakistan (units).

It is evident that the results of the model are neither driven by any specific country nor sensitive to the omission of any country as well. The grey lines are clustered around the dashed line which is the GDP per capita of Synthetic Pakistan and confirms that results are robust and do not diverge significantly.

**Figure 5.8: Falsification Test**



**Source:** Author calculation.

The above sub-sections developed a case for the credibility and reliability of the results of the first objective of the study which was to estimate the impact of terrorism on economy. The next section outline the results and findings of the second objective relating to potential channel that potentially contributed to the economic loss posed by terrorism.

## **5.5 Potential Channels of Economic Cost**

The second objective of the study is to disentangle the potential channels through which terrorism affected the Pakistan's economy. To get a better understanding of the situation; the investment was the major component of GDP that dragged down in the post-terrorism period (Economic Survey 2015-16). Investment is the most volatile component of the GDP and it is also very sensitive to the changes in political and business environment.

### **5.5.1 Gross Capital Formation**

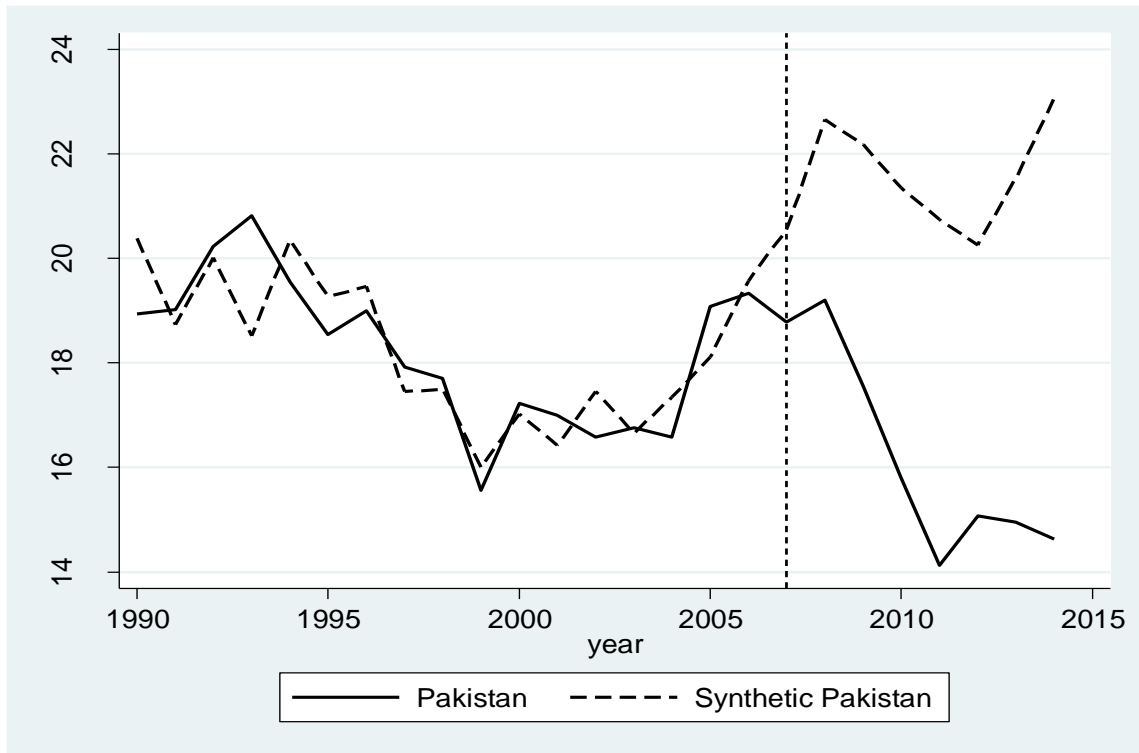
Terrorist incidents accelerated in the Pakistan in 2007 and onwards which in turn deteriorated the overall business environment in the country. To trace out the impact of terrorism on investment, I have used Gross capital formation as a proxy for domestic investment and found a capital thwarting effects.<sup>11</sup>

These causal negative effects are estimated by constructing a Synthetic counterfactual of Pakistan on the basis of Gross capital formation and compared it with actual Pakistan which is in lined with prevalent literature [Enders and Sandler, (1996); Knight *et al.*, (1996); Collier, (1999); Stanistic, (2016)]. Figure 5.9 provides a visual comparison of the two units (treated and control unit) to find out the decline in domestic investment in the country. The dashed line shows a path of Gross capital formation of counterfactual for Pakistan termed as Synthetic Pakistan.

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<sup>11</sup> Gross capital formation (as % of GDP)

**Figure 5.9: Comparison of Gross Capital Formation (% of GDP) of Pakistan and Synthetic Pakistan**



**Source:** Author’s calculation.

While the solid line represent actual Pakistan’s domestic investment path and the vertical dotted line indicates the inception of treatment period in the country. We can observe that after the vertical line the two lines significantly diverged suggesting the causal negative effect of terrorism on domestic investment in Pakistan.

Table 5.4 enlists the characteristics of predictors of Gross capital formation over the pre-treatment (terrorism) period for Pakistan, Synthetic Pakistan and for entire donor pool as well. It is evident from the table that the obtained Synthetic counterfactual of Pakistan overweigh the entire donor pool for a better control unit in terms of all matching criteria. This bolster the argument for Synthetic Pakistan as better counterfactual of actual Pakistan and allowed me to trace out the causal negative effect of terrorism on capital accumulation process of the economy of Pakistan.

**Table 5.4:** Average of Investment predictors of Pakistan, Synthetic Pakistan and Donor Pool

Predictors	Pakistan	Synthetic Pakistan	Donor Pool
Broad Money (1990-1997)	43.78833	43.75028	40.34985
Broad Money (1998-2006)	45.92154	45.8972	48.8903
Credit to Private sector (1990-1997)	24.02525	27.46482	33.41053
Credit to Private sector (1998-2006)	25.02253	27.20488	37.51446
Political Stability/No violence	-1.51889	-0.56077	-0.06918
GDP per capita (1990-1997)	3273.369	3551.272	8568.732
GDP per capita (1998-2006)	3669.171	3855.989	10374.93
Gross Capital Formation (1990)	18.93537	20.38321	22.56985
Gross Capital Formation (1991-1995)	19.63467	19.38081	22.16985
Gross Capital Formation (1996-2000)	17.48373	17.48785	22.28173
Gross Capital Formation (2001-2005)	17.19928	17.19933	21.82213
Gross Capital Formation (2006)	19.332	19.58016	23.46529

**Source:** Author's calculation.

The causal negative effects of terrorism for capital formation are presented in Table 5.5, which shows increasing trend in terms of reduced level of gross capital formation as a percentage of GDP (Matta *et al.*, 2016). The rising trend of lost investment fuelled the overall economic loss with the passage of time and thus supported the earlier result that economic losses increased over the time in Pakistan. The finding indicates that the domestic investment reduced by 5.27 percentage point on average which is measured by gross capital formation in Pakistan over the post-terrorism era as opposed to the Synthetic counterfactual.

**Table 5.5: Reduction in Domestic Investment due to Terrorism**

Year	Loss of GCF (% of GDP)
2007	1.766959
2008	3.453203
2009	4.639729
2010	5.550597
2011	6.62601
2012	5.185915
2013	6.582445
2014	8.42721

**Source:** Author's calculation.

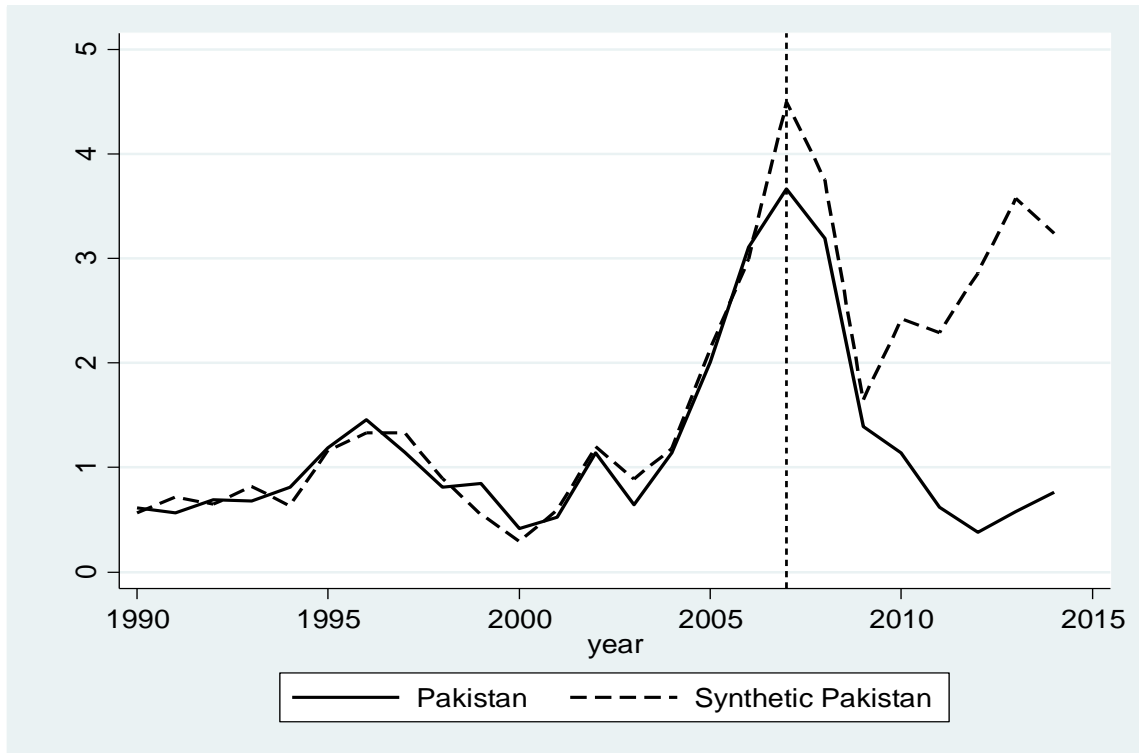
The details regarding the optimal country weights assigned to Synthetic Pakistan are listed in the Table 2 in appendix. An important component of investment is the foreign direct investment which is more crucial element in overall economic growth, especially for developing countries. To analyse the state and implications of terrorism for capital inflows in Pakistan, I have used Foreign Direct Investment net inflows (percentage of GDP) to construct a similar Synthetic Pakistan as I have constructed in case of GDP per capita and domestic investment.

### **5.5.2 Foreign Direct Investment**

Foreign investment was one of the major components of economic composition that faced a substantial downward drag during the time of extreme terror attacks. A closer look at economic survey of Pakistan (2015-16) reveals the declining trend of foreign investment in the country due to fragile security situation. To investigate the causal negative effects for capital inflows in Pakistan due to terrorism, I have constructed a Synthetic counterfactual of Pakistan. The results of the obtained Synthetic Pakistan and actual Pakistan in case of foreign direct investment are presented in figure 5.11 that shows the path of foreign investment over the sample period.

The graph shows that Synthetic Pakistan fairly replicates the pre-treatment (terrorism) characteristics of Pakistan and after the treatment period it significantly diverged from actual Pakistan's FDI path. The comparison of post treatment FDI behaviour yield a causal negative effect of terrorism which started from a vertical dotted line; the Synthetic Pakistan's FDI is higher than the actual Pakistan's FDI as it exposed to the terrorism.

**Figure 5.11: Comparison of FDI of Synthetic and Actual Pakistan**



**Source:** Author's calculation.

The constructed counterfactual of Pakistan optimally replicates the pre-treatment characteristics of Pakistan in terms of foreign direct investment inflows. I have used various capital inflow predictors to construct the Synthetic counterfactual of Pakistan and the average of these predictors along with the actual Pakistan and whole donor pool to compare the results. The Synthetic Pakistan outpace the donor pool as a counterfactual of Pakistan in a pre-treatment (pre-terrorism) period and reinforce the representation of Synthetic Control Pakistan as a potential counterfactual of actual Pakistan. The counterfactual is the best data driven artificial Pakistan which resembles the actual Pakistan in terms of almost all dimensions used for matching (see Table 5.6).

**Table 5.6: Average of FDI predictors of Pakistan, Synthetic Pakistan and Donor Pool**

Predictors	Pakistan	Synthetic Pakistan	Donor Pool
Gross Capital Formation(1990-1997)	19.25307	20.5981	21.43624
Gross Capital Formation(1998-2006)	17.31457	17.53898	21.61313
Broad Money (1990-1997)	43.78833	38.92702	39.27658
Broad Money (1998-2006)	45.92154	43.13356	46.64117
GDP per capita	3482.911	6155.79	9892.065
Political Stability/ No violence	-1.518896	-1.200042	-0.175249
Trade (% of GDP) (1990-1997)	37.2177	49.4644	71.25474
Trade (% of GDP) (1998-2006)	32.16112	52.61505	79.13882
Rule of Law	-.7151527	-.0765435	-0.209792
Total Natural Resource Rent	1.454485	6.662286	6.405981
Foreign Direct Investment (1990-1994)	.6723572	.6776049	1.687679
Foreign Direct Investment (1995-1999)	1.090689	1.054411	2.958031
Foreign Direct Investment (2000-2004)	.7728292	.8326868	3.505461
Foreign Direct Investment (2005-2006)	2.561492	2.566518	4.614023

**Source:** Author's calculation.

Table 5.7 provide the estimated causal negative effect of terrorism on foreign direct investment inflows in Pakistan by comparing Synthetic and actual Pakistan. The causal negative effect can be observed as Pakistan was the recipient of lower level of foreign capital inflows as opposed to the Synthetic Pakistan which is constructed from a countries not subject to the shock of terrorism.

**Table 5.7: Loss of FDI net inflows due to Terrorism**

Year	Loss of FDI net inflows (% of GDP)
2007	0.829927
2008	0.559231
2009	0.255054
2010	1.282148
2011	1.671279
2012	2.477101
2013	2.999768
2014	2.481015

**Source:** Author's calculation.



The magnitude of foregone foreign capital inflows in Pakistan steadily increased with the rise in terrorism in the country; which is consistent with the existing literature [Enders *et al.*, (2006); Abadie and Gardeazabal, (2008); Bandyopadhyay *et al.*, (2014); Filer and Stanistic, (2016)]. The average cost to the economy due to lower foreign capital inflows in Pakistan is estimated to be 1.57 percentage point during the post-terrorism period (starting from 2007 to 2014). The additional detail relating to the optimal weight assigned to the various countries are listed in the Table 3 in appendix.

The findings of the study reveal that the terrorism mainly hurt the capital accumulation and inflow of the capital in the Pakistan which in turn hamper the economic growth. An interesting finding is the major reduction of domestic investment as opposed to the foreign capital inflows in Pakistan. The domestic investment showed a more sensitive behaviour toward overall security environment in the Pakistan as compared to the foreign capital inflows which were mostly directed toward services sector. One of the plausible explanation for less sensitivity of the foreign capital inflows is the relative certainty of return of investment in the services sector as opposed to the investment in industrial sector or agriculture sector. While the industrial and agriculture sector were already receiving a minor portion of foreign capital inflows in the country, and the economy faced a boom in capital inflows due to major reception of capital to the services sector in the pre-treatment period.

## **CHAPTER 6**

### **CONCLUSION**

This study intended to estimate the economic cost of terrorism in Pakistan with the help of statistically advanced data driven methodology-Synthetic Control Analysis (SCM). SCM allow us to obtain a suitable counterfactual for the country of interest and then compare it with the actual unit to get a pure causal effect of any event of interest occurred in the past in a country. Notwithstanding the previous studies relating to economic consequences of terrorism in Pakistan, I have tried to identify the pure causal negative effect of the terrorism in Pakistan and also identified potential channels that contribute to the output loss.

The present study attempted to trace out the causal adverse consequences of terrorism for the economy of Pakistan with the help of SCM to address the research gap in the arena of Growth-Terrorism nexus. A common feature of the cross country growth literature is the treatment of all countries and time periods as a homogenous unit are very dubious and futile presumptions (Durlauf, 2009). Moreover, cross country analysis also prone to the endogeneity problem as well, which is also a serious problem associated with time series analysis as well. The use of SCM accounted for weaknesses associated with the cross country estimates while time varying unobservable confounding factors vary over time as opposed to the assumption of Mill's difference in difference model.

Various countries are included in the donor pool conditional upon their resemblances in terms of structure and growth processes with treated country. Furthermore, another pre-condition for a country to be in a donor pool is that it have not experienced large number of terrorist attacks in post September, 11 world. The

selection of various countries allowed and helped to develop an artificial Pakistan, which shows what would happen to income per capita of a citizen if the country did not face severe attacks of terrorism. This feature of the methodology is the major deviation from the past studies used to calculate the economic cost of terrorism. This methodology does not allow the extrapolation biases that generate an inference from hidden parameters which is ensured by the construction of Synthetic Pakistan as a weighted average of control units. Moreover, it also accounts for endogeneity caused by omitted variable bias with flexibility, granting to time invariant unobservable confounders to vary over time.

The study reveal that economic consequences for Pakistan's economy are substantial and inflicted economic cost to the society. The findings of the study suggest that the economy faced a loss of 260 dollar per capita on average during the post-treatment period. The decline in domestic as well as foreign direct investment are the two major contributor to this loss, which dropped by 5.27 and 1.57 percentage point respectively during the post treatment sample period. Placebo test was then applied to check the reliability of the results by assigning a false treatment to untreated units to ensure the absence of exogenously driven outcome for the actual treated unit (Pakistan). Robustness of the findings are analysed with the help of sensitivity and time series placebo test. The sensitivity test employed by dropping a unit at a time with positive weight to corroborate the finding of the study to be purely driven by chance rather than due to inclusion or exclusion of any unit. While time series placebo test assigned an arbitrary treatment period to ensure the stability of the result and confirms the firmness of outcome of the model.

Potential channels of the output loss in Pakistan are the key factors to guide the way forward for the future direction as the decline in these sectors were the major

setback to the economy of Pakistan. Domestic investment dropped significantly due to terrorism so the authorities should try to ensure the security and stabilization of business environment in the country which is the very generic policy recommendation. Besides, the investment can be enhanced by facilitating the investors in terms of improvement in ease of doing business. The ease of doing business index indicates that Pakistan's ranking is very poor in the world. The ranking can be improved by reducing the ex-ante and ex-post cost of doing business in Pakistan. The country is performing worst in the South Asian region in terms of starting a business, obtaining a construction permit, electricity facility, trading across border and registering a property. The government should try to reduce the cost associated with these aspects of business and ensure that the process is least cumbersome. By improving on these avenues the investment in the country can be attracted to some extent in order to offset the damage caused due to lack of full proof security environment which require a long term eradication strategy.

One of the major limitation of the study was its inability to capture all possible channels through which terrorism affect the economy. Moreover, the study confined to the pure economic consequences of terrorism while the social, health and political consequences are more severe for the individuals and economies subject to the terrorism. In this sense, the estimated cost of the study serves as a lower bound of the overall cost due to the confine to economic dimension only. I have also tried my best to control for the ongoing energy crises in the country which was also present during the post-terrorism era in the country, but the lack of a better proxy for the energy shortfall for Pakistan and donor pool also may be the limitation of the study. Although I have used all possible alternative proxies to capture the energy shock, the results does not showed a significant diversion.

The present study provide various avenues for future research. One of the possible extension of the current study involves the construction of counterfactual of Pakistan based on the shock of energy shortfall. In this case the donor pool will contain a set of countries structurally similar to Pakistan but not exposed to energy shortfall. Additionally, the study can be extended by identifying other potential channels of output loss apart from the domestic and foreign investment.

## REFERENCES

- Abadie, A., & Gardeazabal, J. (2003). The economic costs of conflict: A case study of the Basque Country. *The American Economic Review*, 93(1), 113-132.
- Abadie, A., & Gardeazabal, J. (2008). Terrorism and the world economy. *European Economic Review*, 52(1), 1-
- Abadie, A., Diamond, A., & Hainmueller, J. (2010). Synthetic control methods for comparative case studies: Estimating the effect of California's tobacco control program. *Journal of the American statistical Association*, 105(490), 493-505.
- Abadie, A., Diamond, A., & Hainmueller, J. (2015). Comparative politics and the synthetic control method. *American Journal of Political Science*, 59(2), 495-510.
- Adnan Hye, Q. M., & Ali Khan, R. E. (2013). Tourism-led growth hypothesis: a case study of Pakistan. *Asia Pacific Journal of Tourism Research*, 18(4), 303-313.
- Afonso-Rodríguez, J. A. (2017). Evaluating the dynamics and impact of terrorist attacks on tourism and economic growth for Turkey. *Journal of Policy Research in Tourism, Leisure and Events*, 9(1), 56-81.
- Aisen, A., & Veiga, F. J. (2013). How does political instability affect economic growth?. *European Journal of Political Economy*, 29, 151-167.
- Alesina, A., & Perotti, R. (1996). Income distribution, political instability, and investment. *European economic review*, 40(6), 1203-1228.
- Araz-Takay, B., Arin, K. P., & Omay, T. (2009). The endogenous and non-linear relationship between terrorism and economic performance: Turkish evidence. *Defence and Peace Economics*, 20(1), 1-10.

- Arunatilake, N., Jayasuriya, S., & Kelegama, S. (2001). The economic cost of the war in Sri Lanka. *World Development*, 29(9), 1483-1500.
- Bandyopadhyay, S., Sandler, T. M., & Younas, J. (2011). Foreign direct investment, aid, and terrorism: an analysis of developing countries.
- Barro, R. J. (1991). Economic growth in a cross section of countries. *The quarterly journal of economics*, 106(2), 407-443.
- Barro, R. J., & Lee, J. W. (1994, June). Sources of economic growth. In *Carnegie-Rochester conference series on public policy* (Vol. 40, pp. 1-46). North-Holland.
- Barro, R. J. (1996). *Determinants of economic growth: a cross-country empirical study* (No. w5698). National Bureau of Economic Research.
- Barth, J. R., Li, T., McCarthy, D., Phumiwasana, T., & Yago, G. (2006). Economic impacts of global terrorism: from Munich to Bali.
- Billmeier, A., & Nannicini, T. (2013). Assessing economic liberalization episodes: A synthetic control approach. *Review of Economics and Statistics*, 95(3), 983-1001.
- Blomberg, S. B., Hess, G. D., & Orphanides, A. (2004). The macroeconomic consequences of terrorism. *Journal of monetary economics*, 51(5), 1007-1032.
- Brandt, P. T., & Sandler, T. (2009). Hostage taking: Understanding terrorism event dynamics. *Journal of Policy Modeling*, 31(5), 758-778.
- Brück, T., & Wickström, B. A. (2004). *The economic consequences of terror: A Brief Survey* (No. 03). Households in Conflict Network.
- Chen, A. H., & Siems, T. F. (2004). The effects of terrorism on global capital markets. *European journal of political economy*, 20(2), 349-366.

- Collier, P. (1999). On the economic consequences of civil war. *Oxford economic papers*, 51(1), 168-183.
- Costalli, S., Moretti, L., & Pischedda, C. (2017). The economic costs of civil war: Synthetic counterfactual evidence and the effects of ethnic fractionalization. *Journal of Peace Research*, 54(1), 80-98.
- Czinkota, M. R., Knight, G., Liesch, P. W., & Steen, J. (2010). Terrorism and international business: A research agenda. *Journal of International Business Studies*, 41(5), 826-843.
- DiMaggio, C., & Galea, S. (2006). The Behavioral Consequences of Terrorism: A Meta-Analysis. *Academic emergency medicine*, 13(5), 559-566.
- Dollar, D., & Kraay, A. (2003). Institutions, trade, and growth. *Journal of monetary economics*, 50(1), 133-162.
- Dorsett, R. (2013). The effect of the Troubles on GDP in Northern Ireland. *European Journal of Political Economy*, 29, 119-133.
- Drakos, K., & Kutan, A. M. (2003). Regional effects of terrorism on tourism in three Mediterranean countries. *Journal of Conflict Resolution*, 47(5), 621-641.
- Durlauf, S. N. (2009). The rise and fall of cross-country growth regressions. *History of Political Economy*, 41(Suppl 1), 315-333.
- Eckstein, Z., & Tsiddon, D. (2004). Macroeconomic consequences of terror: theory and the case of Israel. *Journal of Monetary Economics*, 51(5), 971-1002.
- El-Shagi, M., Lindner, A., & von Schweinitz, G. (2016). Real Effective Exchange Rate Misalignment in the Euro Area: A Counterfactual Analysis. *Review of International Economics*, 24(1), 37-66.



Enders, W., & Sandler, T. (1991). Causality between transnational terrorism and tourism: The case of Spain. *Studies in Conflict & Terrorism*, 14(1), 49-58.

Enders, W., Sandler, T., & Parise, G. F. (1992). An econometric analysis of the impact of terrorism on tourism. *Kyklos*, 45(4), 531-554.

Enders, W., & Sandler, T. (1996). Terrorism and foreign direct investment in Spain and Greece. *Kyklos*, 49(3), 331-352.

Enders, W., Sachida, A., & Sandler, T. (2006). The impact of transnational terrorism on US foreign direct investment. *Political Research Quarterly*, 59(4), 517-531.

FBI. (2012). *What we investigate.* , available at <http://www.fbi.gov/albuquerque/about-us/what-we-investigate/priorities> (accessed on 15 April, 2012)

Feenstra, R. C., Inklaar, R., & Timmer, M. P. (2015). The next generation of the Penn World Table. *The American Economic Review*, 105(10), 3150-3182.

Fielding, D. (2003). Modelling political instability and economic performance: Israeli investment during the intifada. *Economica*, 70(277), 159-186.

Filer, R. K., & Stanišić, D. (2016). The effect of terrorist incidents on capital flows. *Review of Development Economics*, 20(2), 502-513.

Fратиани, M., & Kang, H. (2005). Borders and international terrorism. *New Perspectives on Global Governance: Why America Needs the G*, 8, 119-135.

Frey, B. S., Luechinger, S., & Stutzer, A. (2007). Calculating tragedy: Assessing the costs of terrorism. *Journal of Economic Surveys*, 21(1), 1-24.

Global Terrorism Database (GTD), 2016. <https://www.start.umd.edu/gtd/>

Gaibullov, K., & Sandler, T. (2008). Growth consequences of terrorism in Western Europe. *Kyklos*, 61(3), 411-424.

- Gupta, S., Clements, B., Bhattacharya, R., & Chakravarti, S. (2004). Fiscal consequences of armed conflict and terrorism in low-and middle-income countries. *European Journal of Political Economy*, 20(2), 403-421.
- Hess, G. D. (2003). The economic welfare cost of conflict: an empirical assessment.
- Hoeffler, A., & Reynal-Querol, M. (2003). Measuring the costs of conflict. *Washington, DC: World Bank*.
- Hope, D. (2016). Estimating the effect of the EMU on current account balances: A synthetic control approach. *European Journal of Political Economy*, 44, 20-40.
- Judson, R., & Orphanides, A. (1999). Inflation, volatility and growth. *International Finance*, 2(1), 117-138.
- Keynes, J. M. (2016). *General theory of employment, interest and money*. Atlantic Publishers & Dist.
- Knight, M., Loayza, N., & Villanueva, D. (1996). The peace dividend: military spending cuts and economic growth. *Staff papers*, 43(1), 1-37.
- Lenain, P., Bonturi, M., & Koen, V. (2002). The economic consequences of terrorism.
- Malik, Z., & Zaman, K. (2013). Macroeconomic consequences of terrorism in Pakistan. *Journal of Policy Modeling*, 35(6), 1103-1123.
- Mankiw, N. G., Romer, D., & Weil, D. N. (1992). A contribution to the empirics of economic growth. *The quarterly journal of economics*, 107(2), 407-437.
- Matta, S., Appleton, S., & Bleaney, M. (2016). The impact of the Arab Spring on the Tunisian economy. *The World Bank Economic Review*, lhw059.

- Mehmood, S. (2014). Terrorism and the macroeconomy: Evidence from Pakistan. *Defence and Peace Economics*, 25(5), 509-534.
- Mirza, D., & Verdier, T. (2008). International trade, security and transnational terrorism: Theory and a survey of empirics. *Journal of Comparative Economics*, 36(2), 179-194.
- Murdoch, J. C., & Sandler, T. (2004). Civil wars and economic growth: Spatial dispersion. *American Journal of Political Science*, 48(1), 138-151.
- Nasir, M., Rockmore, M., & Tan, C. M. (2016). It's No Spring Break in Cancun: The Effects of Exposure to Violence on Risk Preferences, Pro-Social Behavior, and Mental Health in Mexico.
- Nitsch, V., & Schumacher, D. (2004). Terrorism and international trade: an empirical investigation. *European Journal of Political Economy*, 20(2), 423-433.
- Öcal, N., & Yildirim, J. (2010). Regional effects of terrorism on economic growth in Turkey: A geographically weighted regression approach. *Journal of Peace Research*, 47(4), 477-489.
- Pizam, A., & Smith, G. (2000). Tourism and terrorism: A quantitative analysis of major terrorist acts and their impact on tourism destinations. *Tourism Economics*, 6(2), 123-138.
- Portal, S. A. T. (2016). Fatalities in Terrorist Violence in Pakistan, 2003–2016. *Disponible en Web <http://www.satp.org/satporgtp/countries/pakistan/database/casualties.htm#>*, [Consulta: 27 de julio de 2016].

- Raza, S. A., & Jawaid, S. T. (2013). Terrorism and tourism: a conjunction and ramification in Pakistan. *Economic Modelling*, 33, 65-70.
- Rehman, F. U., & Vanin, P. (2017). Terrorism risk and democratic preferences in Pakistan. *Journal of Development Economics*, 124, 95-106.
- Saeed, L., Syed, S. H., & Martin, R. P. (2014). Historical patterns of terrorism in Pakistan. *Defense & Security Analysis*, 30(3), 209-229.
- Sandler, T., & Enders, W. (2004). An economic perspective on transnational terrorism. *European Journal of Political Economy*, 20(2), 301-316.
- Shahbaz, M., Shabbir, M. S., Malik, M. N., & Wolters, M. E. (2013). An analysis of a causal relationship between economic growth and terrorism in Pakistan. *Economic Modelling*, 35, 21-29.
- Singhal, S., & Nilakantan, R. (2016). The economic effects of a counterinsurgency policy in India: A synthetic control analysis. *European Journal of Political Economy*, 45, 1-17.
- Solow, R. M. (1956). A contribution to the theory of economic growth. *The quarterly journal of economics*, 70(1), 65-94.
- Stanišić, D. (2013). Terrorist Attacks and Foreign Direct Investment Flows between Investors and Hosts. In *33th Dubrovnik Economic Conference, Dubrovnik*.
- Vorsina, M., Manning, M., Fleming, C. M., Ambrey, C. L., & Smith, C. (2015). The welfare cost of terrorism. *Terrorism and Political Violence*, 1-21.
- Yehuda, R., & Hyman, S. E. (2005). The impact of terrorism on brain, and behavior: what we know and what we need to know. *Neuropsychopharmacology*, 30(10), 1773-1780.



## APPENDIX

Table A1: **Variable definitions and Data sources**

Variables	Data Source
GDP per capita, PPP (constant 2011 international dollar)	World Bank, International Comparison Program database.
Agriculture, value added (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Industry, value added (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Services, value added (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Household final consumption expenditure, etc. (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
General government final consumption expenditure (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Gross capital formation (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Foreign direct investment, net inflows (% of GDP)	International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics
Exports of goods and services (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Imports of goods and services (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Life expectancy at birth, total (years)	(1) UNPD. WPP (2) Census reports and other statistical publications from national statistical offices, (3) Eurostat: Demographic Statistics, (4) UNSD. Population and Vital Statistics Reprint (various years), (5) U.S. Census Bureau: International Database, and (6) Secretariat of the Pacific Community: Statistics and Demography Programme.
School enrollment, secondary (% gross)	United Nations Educational, Scientific, and Cultural Organization (UNESCO) Institute for Statistics.
Energy use (kg of oil equivalent) per \$1,000 GDP (constant 2011 PPP)	IEA Statistics © OECD/IEA 2014 ( <a href="http://www.iea.org/stats/index.asp">http://www.iea.org/stats/index.asp</a> )

Population density (people per sq. km of land area)	Food and Agriculture Organization and World Bank population estimates.
Broad money (% of GDP)	International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.
Domestic credit to private sector (% of GDP)	International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates.
Trade (% of GDP)	World Bank national accounts data, and OECD National Accounts data files.
Rule of Law	World Governance Indicators, World Bank
Total Natural Resource rent (% of GDP)	Estimates based on sources and methods described in "The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium" (World Bank, 2011).
Political Stability/ No Terrorism	World Governance Indicators, World Bank

Table A2: Synthetic Weights for Domestic Investment's Control Unit

Country	Weight (W*)
Bolivia	.207
Comoros	.124
Congo Dem. Rep.	.082
Congo Rep.	.032
Guatemala	.215
Indonesia	.115
Malawi	.045
Vanuatu	.18

Source: Author's calculation.

Table A3: Synthetic Weights for FDI's Control Unit

Country	Weight (W*)
Bolivia	.055
India	.074
Indonesia	.227
Kenya	.01
Macao SAR, China	.087
Rwanda	.531
Vanuatu	.016

Source: Author's calculation.