Terrorism and Economic Growth: A Comprehensive Analysis of the Adverse Macroeconomic Effect of Terrorism, 1970-2020

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How does terrorism affect economic growth? This article examines whether an increase in terrorist activity leads to a decrease in economic growth or not. Although previous studies have attempted to unveil the association between terrorism and economic growth, previous literature is still not able to reach a consensus on the influence of terrorism. One of the most important hurdles to unveil the genuine impact of terrorism is to secure generalizability of findings, which has not been achieved by previous studies. This article, using a time-series cross-national analysis on 131 countries from 1970 to 2020, demonstrates that the detrimental impact of terrorism on economic growth is statistically significant across various model specifications. The association is more conspicuous regarding domestic terrorism than transnational one. This article not merely provides empirical evidence for the link between terrorism and economic growth, but also examines the explanatory powers of other determinants concerning economic growth.

Keywords Terrorism, Economic Growth, Time-Series Cross-National Analysis, Political Conflict, Economic Consequences

INTRODUCTION

How does terrorism affect economic growth? This paper offers a comprehensive theoretical and empirical examination on the relationship between terrorism and economic growth. Extant studies have shown that terrorism has various kinds of economic consequences (Enders and Sandler, 2011; Gaibulloev and Sandler, 2019).

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Terrorist incidents can shrink consumption, stock valuation, savings, and investment within borders (Blomberg, Hess, and Orphanides, 2004). They can redirect the flows of humans, capital, materials, goods, and services across borders (Bandyopadhyay, Sandler, and Younas, 2018; Rose, 2009). These findings suggest that terrorism is detrimental to the overall economy of a state.

Does terrorism, however, really shock the national economy entirely and deeply enough to hurt its overall growth rate? The extant literature lacks direct evidence. As suggested above, individual studies have their own focus on certain types of adverse economic effects that terrorist activities can produce. Furthermore, most studies have a limited geographical coverage by concentrating on cases, countries, or regions. Few, if any, take a comprehensive approach to examine the general effect of terrorism on economic growth across the entire world over an overarching time period. Therefore, we do not have a clear picture about how those fragmented findings about various adverse effects of terrorist incidents add up to impact the national economy of a country.

This present study contributes to the understanding of terrorism and its macroeconomic effect in two ways. First, it offers a set of theoretical explanations for how terrorism affects the macroeconomic performance of a state when encountering many terrorist attacks. Second, it provides a generalized finding for the effect of terrorism on economic growth by conducting a time-series cross-national data analysis covering all available countries and years in the post-World War era. This article will be proceeded in the following orders. In the next section, we provide a theoretical examination on the macroeconomic consequences of terrorism. Then, our hypothesis on the association between terrorism and economic growth will be presented with extant evidence. In the data and research design, explanations on data and variables will be discussed. Next, we introduce our empirical analysis on a wide range of countries and years along with various model specifications. Finally, we conclude with implications for policy and future research.

HOW TERRORISM AFFECT THE ECONOMY

How does terrorism economically affect a targeted society? In this section, we conduct a theoretical examination about the macroeconomic consequences of terrorism, building upon the findings and insights in extant research. The overall impact that terrorism has on the economy is supposed to be negative (Ahmad et al., 2022; Blomberg et al., 2004). That is, frequent terrorist attacks should result in reduced economic growth in a targeted country. By and large, terrorism economically destabilizes a target country in multiple ways.

In the first place, terrorist attacks incur direct physical costs as they destroy immediate targets such as government buildings, business facilities, infrastructure, and human beings. Direct costs involve destructed structures, damaged goods, cleanup expenses, reduced short-term commerce, disrupted supply chains, injuries, losses of lives, and lost wages. These immediate damages and losses incur subsequent costs. Remediation and recovery must be done. "Resilience adjustments to mute the initial shock and hasten recovery" are expensive (Rose and Blomberg, 2010, p.1). Insurance

premiums will rise and salaries for at-risk workers will be more expensive (Enders and Sandler, 2011). Due to those detrimental consequences of terrorist attacks, the negative impacts of terrorism tend to be persistent (Gaibulloev and Sandler, 2008b).

The 9/11 attack is the largest single terrorist event with the greatest magnitude of costs and impacts. The estimates for the direct costs range from $50 to $100 billion (Blomberg and Hess, 2009; Riedel, 2010; Rose et al., 2009). According to a researcher from the US Department of Homeland Security (Roberts, 2009), the immediate impact of the 9/11 attack was to reduce employment by 598,000 jobs in the unemployment rate. The study finds the macroeconomic outcomes somewhat grave as the actual real GDP growth rate of the US economy was lowered to 1.1 % from 1.6%, the consensus forecasted values right before September 11, 2001.

Other than the 9/11, the single deadliest terrorist event in human history, the 3/11 terrorist attack of 2004 Madrid Train Bombings is a most prominent case that hat has drawn a largest amount of scholastic and public attention as it then caused the largest loss of life from a single terrorist attack in Modern European history. The terrorist attacks resulted in more nearly 200 deaths and 2000 injuries and its direct economic costs were about 212 million euros, amounting to 0.16 % of the regional GDP of Madrid (Bali, 2007; Buesa et al., 2007). As compared to the 9/11 attack, the macroeconomic effect of the 3/11 attack is relatively low. In fact, other myriads of single terrorist attacks hardly have a sizable impact on the macroeconomic outputs.

The economic impacts of terrorism, however, go beyond direct targets and immediate costs. When terrorist attacks are piled up and horror of terror is unleashed, terrorism can leave substantial consequences at the macroeconomic level reducing the GDP or slowing the GDP growth. Generally, in times of violent crisis, "countries underperform in terms of production and also in terms of consumption" (Thies and Baum, 2020, p.208). Lower productivity and lower consumption result in lower income and lower employment, which, in turn, implies lower production and lower consumption. This process forms a vicious circle, which can be strengthened by other crisis-causing disruptions in investment, trade, portfolio investment, foreign direct investment, tourism, and government expenditures, virtually aggregated to a reduced macroeconomic output.

Although to a lesser degree than war, persistent campaigns of terrorism constitute a form of national crisis as it causes significant socioeconomic disruptions and political destabilization (Park and Bali, 2017; Park and Moon, 2023; Spilerman and Stecklov, 2009). Frequent terrorist attacks and heightened atmospheres of terror shrink economic activities. Of course, this is so first due to the immediate destruction of human capital and physical capital and the resulting disruption of supply chains. Consumer confidence will drop because of the fear and uncertainty created by persistent terrorism (Herzenstein, Horsky, and Posavac, 2015): People need to be more cautious with their spending for the uncertain present and unforeseeable future.

In a similar vein, investors will lose confidence because they cannot be sure about profitability prospects in business and industries. Volatility and uncertainty in financial markets soar with heightened threat and violence (Nikkinen and Vähämaa, 2010). Therefore, investors will withdraw their capitals from or be hesitant to invest in sectors and areas, and regions perceived as high-risk. Furthermore, economic transactions

become more difficult and expensive because of additional security costs required to cover the risks and fear involved (Luca, 2021).

For these economic adverse effects noted about terrorism, there is ample evidence in the literature. For example, based on an exhaustive list of terror attacks in the US for the 1970-2013 period, Brodeur (2018) tests the effects of terrorism on employment and income. He finds that terrorism, especially when attacks are successful, causes job losses by about 2 percent and earnings losses by 2.5% percent. Surprisingly, these findings hold for the omission of the 9/11 attacks and Oklahoma City Bombing, the most catastrophic terror events in the US history. According to the author, most terror attacks in his data are non-catastrophic and the average direct property damages only amount to $750 thousand.

Eckstein and Tsiddon (2004), using the Israeli quarterly data from 1980 to 2003, find that consumption and investment decline significantly with a high rate of terrorist attacks. The impact on investment is found to be three times larger than the impact in consumption. The authors, however, note that per capita annual consumption was cut by about 5 percent when the death toll caused by continued terrorism was at the same level as due to car accidents in 2004. Similar findings hold for a world sample study by Crain and Crain (2006). Using a cross-national data of 147 countries for the period of 1968-2002, they find that terrorist attacks, especially when unanticipated, significantly decrease fixed capital investment and consumer expenditures.

Terrorism is also found to negatively affect stock markets. The negative effect of terrorism on stock valuation has been accrued by various studies with different samples, research designs and methods (Ahmad et al., 2022; Brounen and Derwall, 2010; Chaudhry et al., 2018; Crain and Crain, 2006; Rezazadeh et al., 2024). Even though sudden abnormal returns caused by a single large-scale horrific event tend not to last long after the date of the event (Hassapis, Katsikides, and Markoulis, 2018), terrorist attacks when intensified and prolonged can cause a permanent negative effect on the stock market prices (Arif and Suleman, 2017; Eldor and Melnick, 2007).

The adverse consequences of terrorism do not just fall within the boundaries of targeted economies. The terrorist attacks in a country might deliver negative signals to international investors while decreasing the country's credit rating. The risks, fear, uncertainty, costs, and prospects for unprofitability associated with heightened terror attacks divert the flows of money, goods, businesses, and humans across borders. For instance, examining 102 countries for the period of 2002-2011, Procasky and Ujah (2016) find that countries' credit rating tends to decrease even with a moderate increase in terrorist activity, resulting in a greater cost of debt for sovereigns and firms in affected countries. This is so because of international investors' perception of risks and their unwillingness to endanger their money without a high enough risk premium. Other things being equal, they should prefer safer alternative markets for their investment to terror-suffering countries. Thus, the loss of countries' credit rating and international investment following terrorist attacks can negatively affect economic growth of countries.

Chesney, Reshetar, and Karaman (2011) show that, of the 77 terrorist events in 25 countries for 1994-2005 they consider, about two thirds significantly affected at least one stock market globally. There is also much evidence that terrorism reduces the inflow

of foreign direct investment (Abadie and Gardeazabal, 2019; Polyxeni and Theodore, 2019), the volume of trade (Bandyopadhyay et al., 2018)[1], and the number of inbound tourists (Raja and Raghu, 2021). Often these diverting effects of terrorism spill over into neighboring countries (Filer and Stanišić, 2016; Santamaría, 2021).

Inefficient allocation of government resources is another route through which frequent terrorist attacks hamper economic growth. Terror-suffering governments need to increase spending on defense and security. To do that, they either increase taxes or redirect their expenditures away from more productive uses for health, education, infrastructure, science and technology toward less productive uses for defense, security, and counterterrorism spending (Enders and Sandler, 2011; Luca, 2021; Park and Bali, 2017). Even worse is the possibility that with persistent and enduring terrorist campaign, the additional costs of security and counterterrorism become permanent in terms of a "security" or "terrorist tax" (Saxton, 2002, p.3). Tighter security and proactive counterterrorism increase frictional costs to business activity and international trade, as well. Unlike many other forms of taxes and border tariffs, security taxes do not give any revenues for governments as Walkenhorst and Dihel (2002) sharply point out.

Indeed, persistent terror attacks, increased security concerns, and accompanying measures lead to suboptimal allocation of economic assets in targeted societies after the attacks. In support of this argument, evidence has been documented in the literature. For example, a worldwide sample study by Blomberg et al. (2004) reveals a significant association with a redirection of economic resources from productive investments toward government spending. This evidence is corroborated by a latest finding from a sample of developed countries. Karaalp-Orhan, Evcim, and Deyneli (2024), analyzing a panel data for 34 OECD and 23 EU countries between 2000 and 2020, find that political instability measured in terms of terrorism is a key significant factor that inefficiently increase social spending.

HYPOTHESIS AND EXTANT EVIDENCE

We have explained how and why terrorism produces various kinds of adverse economic consequences. We have also backed our theoretical discussion by linking related findings from previous research to our explanation. It is reasonable to expect that all the harmful economic consequences, noted so far about terrorism, are aggregated to induce a reduction in macroeconomic output or a slower growth. Therefore, we hypothesize as follows:

Hypothesis: *An increase in terrorist activity leads to a decrease in GDP growth.*

Our present study is not the first to test this terrorism-growth hypothesis against time-series cross-national data covering the entire world. Previous studies have tested

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[1] According to Bandyopadhyay et al. (2018), terrorism reduces the volume of trade mainly for manufactured goods rather than primary products.

the presumed negative impact of terrorism on GDP growth against a worldwide sample or its various subsets. Evidence, however, is less than clear, convincing, and generalizable because of flaws and limits in data, research design, and estimation methods. The literature has yet to provide consistent and robust evidence on a worldwide scale.

Blomberg et al. (2004) study is seminal in that it was the first to offer a direct statistical test for the terrorism-growth hypothesis. Using a worldwide sample of 177 countries from 1968 to 2000, the study produces a statistically significant finding that the incidence of transnational terrorism negatively affects the rate of GDP growth. From a world sample of 1427 "selected" transnational terror events for the years of 1987-2001, Tavares (2004) produces an equivalent finding that terrorism, measured as whether the counts of incidents or causalities, has a significant negative impact on GDP growth. However, this result is not robust as terrorism is no longer significant once the standard controls for growth are introduced in the estimating equation.

Since then, statistical studies have focused on particular regions to test the macroeconomic effect of terrorism. For the growth rates of 18 Western European economies from 1971-2004, Gaibulloev and Sandler (2008a) find a significant negative impact of terrorism and the effect is much more conspicuous for transnational terrorism than domestic terrorism. The authors go on to conduct two separate panel data analyses, one for 42 Asian countries from 1970 to 2004 (Gaibulloev and Sandler, 2008b) and the other for 54 African countries from 1970 to 2004 (Gaibulloev and Sandler, 2011). Both find significant results for the negative impact of terrorism on GDP growth. Blomberg, Broussard, and Hess (2011) provide a statistical test for the sub-Saharan Africa including 46 countries for the 1968-2004 period. They find that the African economies are significantly susceptible to terrorist shocks, especially for the post-Cold War era. This fragility is also found to be more serious among countries that heavily rely on oil for growth.

Other follow-up quantitative studies continue to investigate particular regions or countries for particular time periods. Examples include Altay and Çelebioğlu (2015) for the Eurasia region between 1996 and 2013, Mehmood (2014) for Pakistan between 1973 and 2010, Paul and Bagchi (2023) for OECD countries between 2007 and 2017, Iheonu and Ichoku (2021) for 24 most terror-targeted African countries between 2001 and 2018, and Bilgel and Karahasan (2017) for Turkey between 1988 and 2001. These all report a significant result in one way or another that terrorism negatively affects GDP growth.

Indeed, many statistical analyses with a region- or country-specific focus have documented evidence for the growth-reducing effect of terrorism. This evidence, however, is hardly complete as has been gathered from fragmented samples and fragmented periods. Besides, most of the supportive findings are from the cross-country panel data studies that measure terrorism in terms of transnational terrorist incidents. Domestic incidents have been much more prevalent than transnational incidents while the levels of fatalities do not differ much (Gaibulloev and Sandler, 2019).

A comprehensive statistical test is yet to be offered to generalize the effect of terrorism on economic growth. As discussed, the seminal research covering the entire world does not give us consistent and robust evidence (Blomberg et al., 2004; Tavares, 2004). Gaibulloev, Sandler, and Sul (2014) revisit this earlier research and reveal that two problems, Nickell bias and cross-sectional dependence often associated with dynamic

panel modeling, interfere with making consistent and valid statistical inference. Nickell bias arises when fixed effects models are applied to dynamic panel data in which the number of temporal observations, T, is relatively small to the number of cross-national observations, N. Cross-sectional dependence occurs when countries respond to common or similar shocks, such as pandemics and transnational terrorist attacks that influence many countries at once. To address these two problems, Gaibulloev et al. (2014) subdivides their world sample of 99 countries for the 1970-2009 into five regional subsamples ensuring T < N for each estimation and employ factor-augmented regression. Their test results reveal that transnational terrorism become insignificant in affecting GDP growth.

The insignificant finding in Gaibulloev et al. (2014), however, is not conclusive for the macroeconomic effect of terrorism. First, the authors only consider transnational terrorism. It is unclear how similarly countries will respond to domestic terror events in other countries ratcheted up by other countries' domestic insiders. Second, the authors also do not take into account of potential heterogeneities across regions. As criticized by Beck, Katz, and Mignozzetti (2014), estimating regressions with five regional subsamples will introduce unmodeled heterogeneity irrespective of the ratio of N to T.

Improving upon the extant statistical research, we aim to offer an unbiased and valid statistical inference for the general effect of terrorism on GDP growth covering the entire world. While making several renovations, we employ all key analytical strategies of which previous studies miss at least one or many. First, this article, to test the general effect of terrorism, employs a worldwide sample that covers all the countries across the world for which information on necessary data are available. To be specific, the data utilized in our analysis is composed of 131 countries for the most extended time period, 1970-2020. This overarching scope of countries and years enables us to overcome previous literature's limitation on the generalizability of research findings.

Second, we employ a series of regression models to check the robustness of our empirical results. We use fixed effect models as our main estimation method and replicate our analysis with random effect models and ordinary least square (OLS) models. Even though the extended time period help ameliorate the concern regarding N > T (Gaibulloev et al., 2014), a larger time-series sample cannot be the panacea for the concern. The use of random effect models and ordinary least square models is to relieve the concerns of misspecifications of dynamics and confounding factors (Plümper and Troeger, 2019).

Third, we consider both domestic terrorist incidents and transnational terrorist incidents to measure terrorism. As mentioned earlier, most of previous studies have examined only a specific type of terrorism or selected terror events (Gaibulloev et al., 2014; Tavares, 2004). Given that the arbitrary selection on observations leads to sample selection bias (Hug, 2003), this article examines the influence of terrorism on economic growth with observations on both domestic and transnational terrorism.

DATA AND RESEARCH DESIGN

In this section, we introduce variables and dataset, and then we present empirical results

with interpretations. As mentioned above, to test the influence of terrorists' attacks on economic growth, we conduct time-series cross-national analysis on 131 countries from 1970 to 2020 with panel data regressions.

Dependent Variable

As dependent variable, we employ annual percentage growth rate of GDP at market prices which are based on the constant local currency. We rely on the World Development Indicators dataset complied by the Quality of Government (QoG) Institute to measure GDP growth (Teorell et al., 2022). Given the nature of the dependent variable, the unit of analysis is country-year.

Independent Variables

To unveil the influence of terrorism on GDP growth, we rely on the Global Terrorism Database (GTD) which is an open-source event database (LaFree, 2010). The GTD provides systematic data on more than 200,000 domestic and transnational terrorist incident cases since 1970. The GTD has largely been used to examine the causes of terrorism and its potential influences on various social and political phenomena such as economic development, provision of public services, foreign direct investment, the political survival of national leaders (Boehmer and Daube, 2013; Gaibulloev and Sandler, 2011; Meierrieks and Gries, 2013). According to the GTD, terrorist attacks are defined as

> "The threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic religious, or social goal through fear, coercion, or intimidation" (LaFree and Dugan, 2007, p.184).

The database includes information about each attack's location, tactics and weapons, targets, perpetrators, casualties and consequences, and certain motives of the attackers. The GTD classifies terrorism into domestic or transnational ones. The classification depends on whether the nationality of perpetrator group is the same as the location of the terrorist attack or not. If the group's nationality differs from the location of the attack, the attack will be classified as transnational terrorism.

Figure 1 shows the number of terrorism and fatalities across the globe in 2020, the end year of our analysis. As demonstrated, Afghanistan is ranked at the top concerning both the number of terrorist attacks and fatalities. Afghanistan experiences 2012 terrorism with 8740 fatalities. Regarding the number of terrorist attacks, Iraq, Yemen, and Democratic Republic of the Congo come in the next highest orders. Turning to the number of fatalities, Nigeria and Ethiopia are positioned as two of the top three countries.

In our analysis, we take log-transformation of the number of terrorist attacks and fatalities on any, domestic, and transnational terrorism. This decision is based on the findings from previous literature that the influence of terrorism might be not linear (Araz-Takay, Arin, and Omay, 2009; Enders and Hoover, 2012; Iheonu et al.,
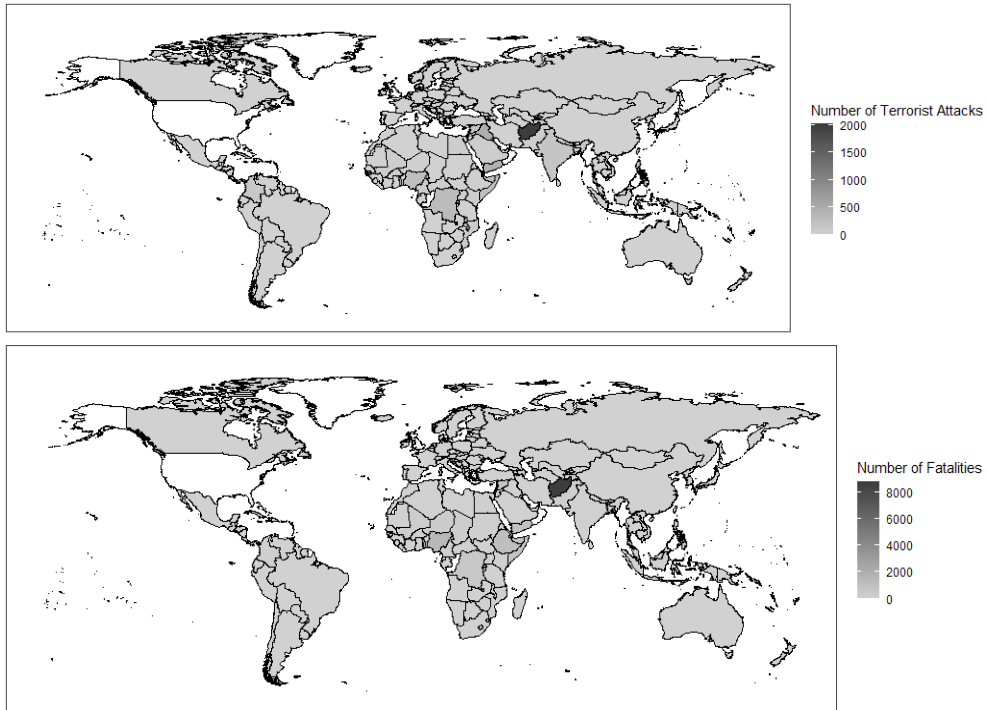
Figure 1. Number of Terrorist Attacks and Fatalities

2022). Logically, it is also plausible that the influence of terrorism does not follow a monotonically increasing function. Moreover, examining different types of terrorist attacks prevents us from concluding the influence of terrorism on economic growth based on only a specific type of terrorism.

Control Variables

To avoid getting a biased estimate, one should control for confounding factors. We employ a set of standard controls that previous research has found important to consider in predicting economic growth in relation to terrorist attacks (Gaibulloev, Piazza, and Sandler, 2017; Gaibulloev and Sandler, 2011; Meierrieks and Gries, 2013).

First, we include the basic political and economic features of countries such as regime type and GDP per capita. To control for the effect of regime type, we employ Polyarchy Index (Coppedge et al., 2021) ranging from 0 (full autocracy) to 1 (full democracy). We measure GDP per capita based on Maddison Project Database (Pleijt and Zanden, 2020). Also, we account for the potential influence of regime duration on economic growth, given that previous studies based on the theory of postmaterialists have provided empirical evidence for the negative influence of regime duration (Grier and Munger, 2006; Inglehart, 1977, 1981). The regime duration is measured by the number of days passed since the current regime started.

Second, we control for demographic characteristics. We include the size of population from Maddison Project Database (Pleijt and Zanden, 2020) and measure education as the average years of education that citizens over 15 have received. Moreover, life expectancy and fertility rate are measured respectively as the average number of years a newborn child would live and as the mean number of children that would be born to a woman. The information on these variables are from the V-Dem data (Coppedge et al., 2021). In addition to demographic characteristics, we also parcel out the influence of public sector corruption on economic growth. This decision is based on the expectation that corruption in public sector tends to result in negative changes in economic aggregate (Jahanzeb and Aziz, 2017). The corruption in public sector is measured by the public sector corruption index from V-Dem data.

Third, we account for the effect of inflation on economic growth. Inflation tends to reduce output economic growth in both developed and developing countries (Azam and Khan, 2022; Khan and Hanif, 2020). Rapidly rising inflation means a rapid loss of purchasing power, which creates more public grievances and fuel more terror attacks (Piazza, 2013). Therefore, it is important to control for the possible confounding effect of inflation for the association between terrorism and economic growth. Using World Development Indicators (WDI), We measure inflation by the consumer price index reflects the annual percentage change.

Lastly, we control for armed conflict that countries experience in a given year. In this way, we can parcel out the influence of terrorism from a graver form of political violence. To measure armed conflict, we rely on the Uppsala Conflict Data Program (UCDP) which has recorded ongoing violent conflicts since the 1970s. The UCDP defines armed conflict as a contested incompatibility that concerns government and territory where the use of armed force results in at least 25 battle-related deaths in a year (Melander, 2015). Thus, the variable indicates the number of armed conflicts in a calendar year of a country.

In Table 1, we present the descriptive statistics of all variables employed in our analysis including mean, standard deviation, minimum and maximum. The number of total country-year observations is 5,211 determined by the data availability. We lag all explanatory variables by one year. Along with endogeneity concerns (Blellemare, Masaki, and Pepinsky, 2017), this decision is due to the GDP growth of the current year (t0) being measured in relation to the GDP of the last year (t-1), by definition. Moreover, the translation of the influence from explanatory variables into GDP growth is not performed at a moment's notice.

In addition to the explanatory variables, country fixed effects are employed to account for unobserved country-specific factors including geographical and political regions of countries. It has been argued that the influence of terrorism differs by specific regions of countries and frequencies of terrorist attacks are largely determined by such regions (Gaibulloev et al., 2014). As a preliminary diagnostic check, we conduct the Variance Inflation Factor (VIF) test for the possible multicollinearity among our explanatory variables. Although the results from the VIF test are not presented, the mean VIFs of all estimated models do not exceed 4, indicating that multicollinearity does not pause a concern for our analysis.

Table 1. Descriptive Statistics

Variable	Mean	Std. dev.	Min	Max
Dependent Variable				
GDP Growth	3.742	5.314	-62.076	123.140
Independent Variables				
Any Terrorism, logged N	0.997	1.493	0.000	7.270
Domestic Terrorism, logged N	0.621	1.290	0.000	7.072
Transnational Terrorism, logged N	0.674	1.115	0.000	7.116
Fatalities of Any Terrorism, logged N	0.836	1.656	0.000	9.166
Fatalities of Domestic Terrorism, logged N	0.476	1.399	0.000	8.929
Fatalities of Transnational Terrorism, logged N	0.360	1.062	0.000	9.166
Control Variables				
Democracy	0.495	0.285	0.012	0.926
Public Sector Corruption	0.460	0.310	0.001	0.979
Regime Duration	8079.590	8062.220	0.000	45393.000
GDP per capita, logged	8.769	1.166	6.000	11.345
Life Expectancy	67.416	9.754	9.500	84.800
Fertility	3.651	1.953	0.980	8.460
Education	6.757	3.355	0.100	13.610
Population, logged	7.145	1.484	1.876	11.902
Inflation	44.548	602.710	-16.117	24410.980
Armed Conflict, logged N	0.224	0.481	0.000	2.398

Note: All explanatory variables are lagged by one year.

RESULTS

In Table 2, we present the results from our fixed effects models. In Model 1, our terrorism measure is the logged annual number of any terror attacks regardless of their types whether domestic or transnational in a given country. Terrorism is significant at the 0.01 level in the expected direction, suggesting that terrorist attacks are detrimental to GDP growth. In Model 2, we distinguish between domestic terrorism and transnational terrorism. Domestic terrorism is negative and significant at the 0.05 level whereas the negative coefficient for transnational terrorism is insignificant at any conventional level. Therefore, much of the growth-hurting effect of terrorism is due to domestic terrorism rather than transnational terrorism.

This result provides empirical evidence for the importance of domestic terrorism determining economic growth. For instance, Savun and Tirone (2018) demonstrate that the reduction of domestic terrorism rather than trinational one increases a country's economic stability and foster trade. In turn, less domestic terrorist attacks help the country receive more foreign aids for economic growth (Gaibulloev and Sandler, 2023).

Table 2. The Effect of Terrorism on GDP Growth, fixed effects models, (1970-2020)

	Model 1	Model 2	Model 3	Model 4
Independent Variables				
Any Terrorism, logged N	-0.242**			
	(0.075)			
Domestic Terrorism, logged N		-0.217*		
		(0.094)		
Transnational Terrorism, logged N		-0.116		
		(0.107)		
Experience (Any Terrorism)			-0.476*	
			(0.185)	
Experience (Domestic Terrorism)				-0.303
				(0.221)
Experience (Transnational Terrorism)				-0.226
				(0.191)
Control Variables				
Democracy	0.623	0.616	0.700	0.723
	(0.664)	(0.664)	(0.663)	(0.663)
Public Sector Corruption	-0.637	-0.608	-0.566	-0.559
	(0.749)	(0.749)	(0.749)	(0.750)
Regime Duration	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita, logged	-2.069***	-2.047***	-2.161***	-2.135***
	(0.303)	(0.304)	(0.305)	(0.305)
Life Expectancy	0.038	0.038	0.041	0.040
	(0.026)	(0.026)	(0.026)	(0.026)
Fertility	-0.736***	-0.744***	-0.709***	-0.716***
	(0.170)	(0.170)	(0.170)	(0.170)
Education	-0.546***	-0.544***	-0.520**	-0.518**
	(0.162)	(0.162)	(0.162)	(0.162)
Population, logged	0.161	0.110	0.036	-0.011
	(0.589)	(0.592)	(0.586)	(0.586)
Inflation	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Armed Conflict, logged N.	0.222	0.253	-0.010	0.016
	(0.305)	(0.307)	(0.288)	(0.293)
Constant	24.844***	24.968***	25.977***	26.085***
	(4.728)	(4.733)	(4.707)	(4.708)
N of Observations	5211	5211	5211	5211
AIC	31534.972	31536.203	31538.864	31543.053
BIC	31613.674	31621.463	31617.566	31628.314

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

The empirical results are not dramatically changed when we estimate models without outliers such as observations with GDP growth higher than 10 and with Terrorism independent variables higher than 5. Although not presented due to the lack of space, these unchanged results indicate that what we have found about the growth-reducing effect of domestic terrorism are not sensitive to the inclusion and exclusion of outlying observations.

In Model 3, we use a binary measure for terrorism to indicate if a country in a given year experiences at least one terrorist attack whether domestic or transnational in a given year. As Ismail and Amjad (2014) mention, whether or not experieicing a terrorist attack may make a more meaningful difference for a society and its people than how frequently experieincing terrorist attacks. Also, the use of binary independent variables helps prevent the empirical results from being biased due to the outliers. The terrorism dummy appears to have a significant negative impact on GDP growth at the 5% level. This significant result suggests a slower economic growth for a country when it experiences a terrorist attack. However, when domestic terrorism and transnational terrorism are separately measured into two different dummies in Model 4, neither of them is statistically significant at any conventional level.

Based on the results from Model 1 through Model 4, it can be said that frequent terrorist attacks reduce economic growth and this growth-reducing effect is more conspicuous when attacks are ratcheted up by domestic perpetrators rather than foreign perpetrators. In addition, an occurrence of any form of terrorism also contributes to a slower economic growth in a target society. In terms of model fit, both Akaike (AIC) and Bayesian (BIC) information criteria prefer Model 1 to all the others.

Regarding the effects of our control variables, GDP per capita, fertility, education, and inflation appear to negatively affect GDP growth. They are all statistically significant at the 1% level. The adverse relationship between GDP per capita and economic growth can be attributed to the increasing opportunity costs of economic activities in high income societies (Melnyk et al., 2021; Wennekers et al., 2007). The negative influence of fertility echoes the findings from Li (2016) and Karra, Canning, and Wilde (2017), while that of education is in line with Sasmaz and Bayar (2024). Moreover, the result for inflation matches with Barro (2013) finding that inflation has a significant negative impact on both GDP growth and investment. All the results for these significant controls hold qualitatively the same for the rest of our analyses, except for education that loses statistical significance in random effects models in Table 4.

It is also worth noting that armed conflict is not statistically significant at any level of p-value. At the first glance, it is more plausible to expect the negative influence of armed conflict on GDP growth. However, As Meierrieks and Gries (2013) explain, the dynamics, intensity, and modes of terrorist attacks are basically different from armed conflicts. Also, our finding echoes the results from Sambanis (2008) demonstrating terrorism and armed conflicts such as civil war have no identical roots and mechanism. Unlike civil conflicts, for instance, terrorist attacks often occur in developed economies as well as developing economies.

Table 3. The Effect of Fatalities on GDP Growth, fixed effects models (1970-2020)

	Model 5	Model 6	Model 7	Model 8
Independent Variables				
Fatalities of Any Terrorism, logged N	-0.219***			
	(0.061)			
Fatalities of Domestic Terrorism, logged N		-0.256***		
		(0.072)		
Fatalities of Transnational Terrorism, logged N		-0.165*		
		(0.083)		
Existence of Fatalities (Any Terrorism)			-0.574**	
			(0.199)	
Existence of Fatalities (Domestic Terrorism)				-0.851**
				(0.272)
Existence of Fatalities (Transnational Terrorism)				-0.396
				(0.232)
Control Variables				
Democracy	0.610	0.587	0.673	0.617
	(0.663)	(0.664)	(0.663)	(0.664)
Public Sector Corruption	-0.673	-0.678	-0.592	-0.601
	(0.750)	(0.750)	(0.749)	(0.749)
Regime Duration	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita, logged	-2.068***	-2.070***	-2.127***	-2.113***
	(0.303)	(0.303)	(0.304)	(0.304)
Life Expectancy	0.035	0.036	0.040	0.042
	(0.026)	(0.026)	(0.026)	(0.026)
Fertility	-0.732***	-0.736***	-0.735***	-0.744***
	(0.170)	(0.170)	(0.170)	(0.170)
Education	-0.539***	-0.534***	-0.540***	-0.539***
	(0.162)	(0.162)	(0.162)	(0.162)
Population, logged	0.207	0.155	0.061	0.031
	(0.589)	(0.592)	(0.586)	(0.586)
Inflation	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Armed Conflict, logged N	0.285	0.315	0.056	0.120
	(0.307)	(0.309)	(0.292)	(0.295)
Constant	24.542***	24.833***	25.719***	25.749***
	(4.731)	(4.740)	(4.709)	(4.709)
N of Observations	5211	5211	5211	5211
AIC	31532.599	31533.61	31537.108	31536.825
BIC	31611.302	31618.871	31615.81	31622.086

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

Now, we consider the effect of terrorism on GDP growth in terms of fatal terrorist events, attacks that cause at least one fatality. Fatal events may leave graver aftermaths and afterimages in target societies than do non-fatal events. Small scale and nonfatal attacks could go unnoticed to the public eyes in targeted societies. In Table 3, we replicate our fixed effects regressions with fatalities of terrorism.

The negative effect of fatalities on GDP growth appears to be robust. Fatal terrorism when measured as the number of fatalities is negative and significant in Models 5 and 6, suggesting the greater number of fatalities, whether domestic and transnational, the slower economic growth. In terms of experience, fatal terrorism is negative and significant in Model 7, suggesting experience of fatal terrorism, in general, reduces macroeconomic performance. Yet, this growth-reducing effect of fatal terrorism experience largely comes from domestic terrorism experience rather than transnational terrorism experience. Domestic terrorism experience is statistically significant at the 1% level whereas transnational terrorism is not significant in Model 8. This discriminating result again reinforces previous evidence for the importance of domestic terrorism on economic growth (Gaibulloev et al., 2014).

Robustness Check

As a robustness check for the results from our fixed effects models, we redo our regression analysis with country random effects. Along with fixed effects method, random effects method is one of the ways to handle the problem of hierarchical data (Bell and Jones, 2015). Even though fixed effects have been considered the gold standard default for time-series cross-national analysis (Schurer and Yong, 2012), random effects have also gained prominence in economics and political science (Beck and Katz, 2011). One can use the Hausmann specification test to select between fixed and random effects.

Yet, since the fixed vs. random effects debate is still ongoing (Bartels, 2008; Dias and Lelkes, 2022; Imai and Kim, 2019), we decide to provide random effects results as well as fixed effects ones as a robustness check (Baltagi and Liu, 2016; Clark and Linzer, 2015). Terrorism is even more consistently significant with random effects models. In all eight specifications from Model 9 through Model 16, there are four occasions that a measure for terrorism fails to have a statistical significance. In Models 10 and 12, transnational terrorism, measured as the logged number of terrorist attacks and the binary indicator respectively, does not significantly affect economic growth. Similarly, in Models 14 and 16, the logged counter measure and the binary variable for fatalities of transnational terrorism are not statistically significant. In all the other models with random effects, terrorism has a negative significant influence on the macroeconomic performance of targeted countries, regardless of origin (domestic or transnational) and measurement (count or dummy).

Table 4. Robustness Check with Random Effects

Independent Variables	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
Any Terrorism, logged N	-0.218** (0.068)							
Domestic Terrorism, logged N		-0.279** (0.087)						
Transnational Terrorism, logged N		-0.005 (0.096)						
Experience (Any Terrorism)			-0.410* (0.176)					
Experience (Domestic Terrorism)				-0.423* (0.213)				
Experience (Transnational Terrorism)				-0.104 (0.184)				
Fatalities of Any Terrorism, logged N					-0.203*** (0.057)			
Fatalities of Domestic Terrorism, logged N						-0.263*** (0.068)		
Fatalities of Transnational Terrorism, logged N						-0.118 (0.078)		
Existence of Fatalities (Any Terrorism)							-0.507** (0.191)	
Existence of Fatalities (Domestic Terrorism)								-0.925*** (0.263)
Existence of Fatalities (Transnational Terrorism)								-0.245 (0.222)

	Model 9	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16
Control Variables								
Democracy	-1.119*	-1.136*	-1.162*	-1.128*	-1.141*	-1.160*	-1.165*	-1.194*
	(0.515)	(0.515)	(0.514)	(0.514)	(0.514)	(0.514)	(0.515)	(0.515)
Public Sector Corruption	-1.220*	-1.162*	-1.241*	-1.190*	-1.142*	-1.152*	-1.199*	-1.193*
	(0.495)	(0.496)	(0.495)	(0.496)	(0.494)	(0.495)	(0.495)	(0.496)
Regime Duration	-0.000*	-0.000*	-0.000*	-0.000*	-0.000*	-0.000*	-0.000*	-0.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP per capita, logged	-1.161***	-1.157***	-1.192***	-1.181***	-1.184***	-1.188***	-1.200***	-1.200***
	(0.211)	(0.212)	(0.211)	(0.211)	(0.211)	(0.211)	(0.212)	(0.212)
Life Expectancy	0.044*	0.044*	0.044*	0.044*	0.043*	0.043*	0.044*	0.045*
	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)	(0.021)
Fertility	-0.369**	-0.386***	-0.355**	-0.362**	-0.379**	-0.387***	-0.375**	-0.389***
	(0.116)	(0.117)	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)	(0.116)
Education	-0.105	-0.116	-0.094	-0.100	-0.105	-0.110	-0.105	-0.114
	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)	(0.081)
Population, logged	0.121	0.113	0.099	0.101	0.102	0.102	0.091	0.100
	(0.094)	(0.094)	(0.093)	(0.094)	(0.092)	(0.093)	(0.093)	(0.093)
Inflation	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Armed Conflict, logged N	0.350	0.401	0.130	0.178	0.417	0.470	0.198	0.301
	(0.274)	(0.275)	(0.257)	(0.263)	(0.277)	(0.279)	(0.262)	(0.266)
Constant	13.782***	13.854***	14.099***	14.006***	14.148***	14.223***	14.316***	14.315***
	(2.155)	(2.158)	(2.146)	(2.152)	(2.138)	(2.142)	(2.144)	(2.147)
N of Observations	5211	5211	5211	5211	5211	5211	5211	5211

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. AICs and BICs are not estimated in models with random effects.

Some might argue that fixed effect or random effect models can be more harmfully biased than naïve ordinary least square (OLS) estimates by misspecifications of dynamics and confounding factors (Plümper and Troeger, 2019). Thus, we also replicated our analysis without fixed and random effects. Though not presented here in the text, our OLS models produce similar significant results for the effect of terrorism on GDP growth, only with slight differences in estimated coefficients and standard errors to the results from random effect models.

CONCLUSION AND DISCUSSION

Whether an increase in terrorist activity leads to a decrease in GDP growth has remained an important intriguing question in the terrorism literature. Although many studies have reported that terrorism is detrimental to GDP growth, the evidence is limited to certain cases, countries, regions, or subgroup countries (Bilgel and Karahasan, 2017; Gaibulloev and Sandler, 2011; Paul and Bagchi, 2023). Several attempts have been made to unveil the relationship between terrorism and economic growth against worldwide samples (Blomberg et al., 2004; Tavares, 2004). Yet, the findings from these studies are mixed and none is convincing because of their flaws and limits in data and research design.

We improve upon previous research in four ways. First, we provide a comprehensive theoretical explanation for why and how heightened terrorism shrinks various economic activities and these are added up to overall macroeconomic underperformance. Second, our study has the most extensive scope covering all 131 countries and all 51 years across the world for which necessary data are available. Especially, the extended time period should help attenuate the methodological problems, associated with small T in relation to large N, that hamper consistent and unbiased estimation in previous research (Beck et al., 2014; Gaibulloev et al., 2014). Third, unlike the previous worldwide sample research, we consider domestic terrorism as well as transnational terrorism. We also consider several alternative measures for our main independent variable, terrorism, such as the logged counter for terrorist attacks and the dummy for experiencing at least one terrorist event in a given year in a given country. We further differentiate fatal terrorist attacks from nonfatal attacks. Fourth, for the robustness of our statistical findings, we use three alternative methods for estimation including fixed effects, random effects, and OLS models (Beck and Katz, 2011; Plümper and Troeger, 2019).

Our empirical results across different methods and specifications indicate that terrorism, in general, is a significant detrimental factor for economic growth. To be specific, any types of terrorism without differentiation between domestic and transnational terrorism tend to negatively affect GDP growth. This significant effect for any terrorism mostly holds for domestic terrorism, as well. However, transnational terrorism, in of all 16 models, is only significant for its negative effect on economic growth when it is measured as the logged number of fatalities in Model 6.

While we believe the evidence from our study help resolve the debate on the effect of terrorism on economic growth, it leaves some intriguing puzzles, as well. So, our discussion naturally turns to implications for future research. It should be fruitful to

delve into why domestic terrorism rather than transnational terrorism has a statistically meaningful influence on macroeconomic output. As Meierrieks and Gries (2013) suggest related to heterogeneous impacts of domestic and transnational terrorism, one may want to focus on the possible differences in characteristics between domestic attacks and transnational attacks. The effect of terrorism on economic growth may vary by regime types, levels of wealth, and other political and socioeconomic conditions. Some interactive analyses should help us better understand the macroeconomic effect of terrorism by specifying under what conditions terrorism affects economic growth in what ways.

We conclude with a brief discussion for policy implication. It is crucial to draw policy implication from the empirical results with some degree of caution. For one thing, our results show that frequent terrorist attacks reduce economic growth. Thus, governments need to expect economic growth to stagnate after terrorist attacks and be alerted to perform efficient budget planning and expenditure strategies leading to an optional financial performance. For another thing, policy makers should pay more attention to deter terrorist attacks, especially domestic ones. More fundamentally, closely identifying potential factors, such as ethnic and religious conflict, leading to domestic terrorism is necessary. Further, it is strongly recommended for policy makers to resolve grievances and social unrests so that domestic terrorism rooted from such factors does not lead to an economic crisis.

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