



TERRORISM AND ECONOMIC GROWTH IN SUB-SAHARAN AFRICAN COUNTRIES: A PANEL CAUSALITY ANALYSIS

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ABSTRACT

Terrorism and its economic costs have increased in recent years in the globalized world. Therefore, in the study, the mutual relationship between economic growth and terrorism in 18 Sub-Saharan African economies for the 2007-2019 period was investigated via causality analysis. The findings of panel level causality analysis pointed out a bilateral causality between economic growth and terrorism, but the findings of country level causality analysis between two variables changed depending on country specific economic and institutional characteristics.

Keywords: Terrorism, Economic Growth, Panel Causality Analysis

JEL Classification: C23, D74, F43

SAHRA ALTI AFRİKA ÜLKELERİNDE TERÖRİZM VE EKONOMİK BÜYÜME: BİR PANEL NEDENSELLİK ANALİZİ

ÖZET

Küreselleşen dünyada terörizm ve ekonomik maliyetleri son yıllarda artmıştır. Bu nedenle çalışmada, nedensellik analizi kullanılarak 2007-2019 dönemi için 18 Sahra Altı Afrika ekonomisinde ekonomik büyüme ve terörizm arasındaki karşılıklı ilişki araştırılmıştır. Panel düzeyinde nedensellik analizi bulguları, ekonomik büyüme ve terörizm arasında iki yönlü bir nedensellik ilişkisine işaret ederken, iki değişken arasında ülke düzeyinde nedensellik analizi bulguları ise, ülkeye özgü ekonomik ve kurumsal özelliklere bağlı olarak değişkenlik göstermektedir.

Anahtar Kelimeler: Terörizm, Ekonomik Büyüme, Panel Nedensellik Analizi

JEL Sınıflama: C23, D74, F43



1. Introduction

Terrorism is an important source of worry in the globalized world. Terrorism can negatively affect not only welfare and economic development levels, but also economic, social, political, financial, and cultural structures of the countries. Terrorist incidents have potential to adversely influence the economic growth via discouraging the consumer and investor confidence (Frey et al., 2004). Therefore, a peaceful environment is a prerequisite for economic growth and development. The economic activities may not be at the desired levels in an environment with intense terrorism and low security. Therefore, terrorism can cause serious damages to the economies and financial systems of the countries (Özkaya and Şimşek, 2017). In the related literature, negative effect of terrorism on domestic and foreign investments, employment, financial markets, tourism, and technological development have been revealed by many scholars (Drakos and Kutan, 2003; Emsen and Değer, 2004; Enders et al., 2006; Greenbaum et al. 2007; Gul et al. 2010; Bandyopadhyay et al., 2011; Rasheed and Tahir, 2012; Altay et al. 2013; Bashir et al. 2013; Buigut and Amendah, 2016; Alam and Mingque, 2018; Okafor and Piesse, 2018; HongXing et al., 2020; Bayter, 2021; Santamaría, 2021). On the other side, poverty, income inequality, slow economic growth, unemployment, shadow economy and political instability are the important factors fostering the terrorism (Freytag et al., 2011; Malik and Zaman, 2013; Ismail and Amjad, 2014; Nurunnabi and Sghaier, 2018; Abid and Sekrafi, 2020).

Terrorism can lead the high borrowing cost and decreases in domestic and foreign investments through raising the insecurity, risk and uncertainty (Cevik and Ricco, 2019). On the other side, the growing security measures, high insurance premiums and raising financial regulation together with terrorism puts up the transaction costs and in turn negatively affects the economic growth via lowering the productivity (Johnston and Nedelescu, 2005). Furthermore, terrorist incidents can also negatively influence the economic growth by reducing the investments and weakening the financial situation through destroying the physical infrastructure and human capital (Edeme and Nkalu, 2019). Terrorism also leads additional labor and capital costs and research and development costs in security and defense areas. Therefore, increases in defense expenditures in combat with terrorism can lead decreases in economic growth (Lenain et al., 2002; Gaibulloev et al., 2010; Yang et al., 2012; Bhattacharyya, 2019; Krieger and Meierrieks, 2019; Luca and Căriman, 2021). In this context, destructive effects of terrorist incidents on investments, foreign trade and financial structure may lead the fluctuations in the markets. As



a consequence, the direct and indirect effects of terrorism can negatively affect the economic growth (Sandler and Enders, 2005; Zakaria et al., 2019). On the other hand, economic growth can be a cause of terrorism via raising the unemployment, poverty, and income inequality (Bayar, 2019; Öztürk, 2021). Therefore, a mutual interaction between terrorism and economic growth is expected at theoretical terms.

The economic impact of terrorism was USD 26.4 billion in 2019 (Institute for Economics & Peace, 2020). But 86% of the economic costs of terrorism occurred in Sub-Saharan Africa (USD 12.5 billion), South Asia (USD 5.6 billion), and MENA (USD 4.7 billion) (Institute for Economics & Peace, 2020). 7 countries ((Burkina Faso, Mozambique, Democratic Republic of Congo, Mali, Niger, Cameroon, and Ethiopia)) from top ten countries, which had the highest increments in terrorism in 2019, located in Sub-Saharan African region and 41% of total terrorist attacks by Islamic State of Iraq and the Levant (ISIL) took place in Sub-Saharan African region (Institute for Economics & Peace, 2020).

The article investigated the causal relationship between economic growth and terrorism in sample of Sub-Saharan African countries, one of the regions in the world which has been mostly exposed to terrorism through causality analysis and in turn takes aim at making a contribution to the empirical literature. In this context, Section 2 summarizes the literature about growth-terrorism nexus, and data and method are explained in Section 3. Section 4 implements the empirical analysis and the article is concluded with the Conclusions.

2. Literature Review

Terrorism is a critical global problem for all countries in the world and can negatively influence the countries through various economic, social, and cultural channels. The scholars have generally investigated the influence of terrorism on economic growth in different countries and country group and generally deduced a negative growth influence of terrorism (e.g. see Blomberg et al., 2004; Gaibulloev and Sandler, 2008; Shahrestani and Anaraki, 2008; Ocal and Yildirim, 2010; Freytag, Krüger, Meierrieks and Schneider, 2011; Meierrieks and Gries, 2012; Akıncı et al., 2014; Hyder et al., 2015; Çınar, 2017; Şit and Karadağ, 2019; Zakaria et al., 2019; Saleem et al., 2020; Gökce and Kaya, 2021). Some scholars have discovered a unilateral causality from terrorism to economic growth (e.g. see Shahbaz et al., 2013; Shahbaz, 2013), but some scholars have revealed a unilateral causality from economic growth to terrorism (e.g. see Gries et al., 2011; Shahbaz, et al., 2011; Shahbaz 2013; Bayar, 2016). Bayar and Gavriletea (2018) revealed a bidirectional causality between economic growth and terrorism.



In this context, Blomberg et al. (2004) analyzed the growth effect of terrorism in a panel of 177 countries over the 1968-2000 period and reached a negative growth influence of terrorism. On the other hand, Shahrestani and Anaraki (2008) analyzed the economic impacts of terrorism in 30 developing and developed countries through dynamic regression analysis and found that terrorism negatively influenced the economic growth. Gaibulloev and Sandler (2008) researched the growth influence of national and international terrorist incidents in 18 West European economies over the 1971-2004 period via regression analysis and found that both national and international terrorist incidents had a negative influence on economic growth. Freytag et al. (2011) also investigated the relationship between economic growth and terrorism in 110 countries for the 1971-2007 period through negative binomial regression and reached that terrorism negatively influenced the economic growth.

Caruso and Schneider (2011) researched the socio-economic determinants of terrorism in 12 West European economies and revealed that economic growth decreased the terrorism, but youth unemployment raised the terrorism. Gries et al. (2011) analyzed the causality between economic growth and terrorism in 7 West European economies via Hsiao–Granger method and revealed a unilateral causality from economic growth to terrorism.

Meierrieks and Gries (2012) explored the interaction between economic growth and terrorism in 18 Latin American countries for the 1970-2007 period through negative binomial regression and Granger causality and reached that the interaction economic growth and terrorism varied depending on countries' development level and revealed a negative growth effect of terrorism for underdeveloped countries. On the other side, Shahbaz et al. (2013) analyzed the relationship between economic growth and terrorism in Pakistan over the duration of 1973-2010 via ARDL approach and Granger causality test and pointed out a unilateral causality from terrorism to economic growth. Akıncı et al. (2014) researched the influence of terrorism on inflation and economic growth in 152 countries through Pedroni and Kao cointegration test and Granger causality test and reached that terrorism raised the inflation and in turn decreased the economic growth. Hyder et al. (2015) explored the relationship between economic growth and terrorism in Pakistan for the 1981-2012 duration via cointegration analysis and disclosed a negative growth influence of terrorism. Çınar (2017) researched the influence of terrorism on economic growth in 115 countries for the 2000-2015 duration and revealed that the negative growth influence of terrorism was relatively higher especially in the low-income countries.

Bayar and Gavriletea (2018) explored the interaction among terrorism, peace, and economic growth in 18 MENA countries through cointegration and causality analyses and disclosed a



negative influence of terrorism on economic growth in the long term, and a bilateral causality between economic growth and terrorism was reached. Mubashra and Shafi (2018) investigated the effect of terrorism and counterterrorism on economic growth in Pakistan for the 1980-2015 period through ARDL approach, Granger causality test, and negative binomial regression and found that counterterrorism policies had a positive impact on economic growth in the long term. Şit and Karadağ (2019) researched the relationship between economic growth and terrorism in Egypt, Iran, Saudi Arabia, and Turkey for the 2003-2016 duration via regression analysis and discovered a negative growth effect of terrorism.

Zakaria et al. (2019) explored the influence of terrorism on economic growth in Pakistan for the 1974-2014 duration through generalized method of moments and disclosed a negative growth influence of terrorism. Saleem et al. (2020) reached the similar findings for Pakistan through ARDL approach. Gökce and Kaya (2021) explored the effect of terrorism on economic growth in BRICS-T (Brazil, Russia, India, China, South Africa-Turkey) for the 2005-2019 period through regression analysis and discovered a negative influence of terrorism on economic growth.

3. Data and Method

The study researched the causality between terrorism and real GDP per capita in Sub-Saharan African countries. In the applied section of the study, economic growth was proxied by real GDP per capita based on constant 2015 US\$ and provided from World Bank (2022). On the other side, terrorism was represented by global terrorism index (takes value between 0 (no impact from terrorism) and 10 (highest impact of terrorism)) of Institute for Economics & Peace (2022). Global terrorism index is calculated employing the factors of number of terrorist incidents, number of fatalities by terrorism, number of injuries caused by terrorism, and property damage by terrorist incidents and each terrorist incident is rated regarding the four factors, the measures are multiplied by weighting factor and then summed. GTI score is obtained by aggregating all incident following the aforementioned process (Institute for Economics & Peace, 2020).

Table 1: Dataset definition

Variables	Description	Source
GDP	GDP per capita (constant 2015 US\$)	World Bank (2022a)
GTI	Global terrorism index	Institute for Economics & Peace (2022)



The study sample included 18 countries (Burundi, Central African Republic, Chad, Congo, Dem. Rep., Cote D'ivoire, Ethiopia, Kenya, Mali, Mozambique, Niger, Nigeria, Rwanda, Senegal, South Africa, Sudan, Tanzania, Uganda, and Zimbabwe) from Sub-Saharan Africa. However, Angola, Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Comoros, Congo, Rep., Equatorial Guinea, Eritrea, Eswatini, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Lesotho, Liberia, Madagascar, Malawi, Mauritania, Mauritius, Namibia, Sao Tome and Principe, Seychelles, Sierra Leone, Somalia, South Sudan, Togo, and Zambia from the region by World Bank (2022b) were not included in the empirical analysis due to non-available terrorism data over the study period. The empirical analyses were carried out by statistical packages of Stata 15.0 and Gauss 10.0.

The key characteristics of the real GDP per capita and terrorism were denoted in Table 2. The average of real GDP per capita was about USD 1226.525 in the sample, but considerable changes in terms of real GDP per capita were detected among the countries. On the other side, the average of global terrorism index was 4.1053, but it was relatively less changed among the countries.

Table 2: Summary statistics of the dataset

Variables	Mean	Std. Deviation	Minimum	Maximum
GDP	1226.525	1221.463	278.3194	5754.485
GTI	4.1053	2.05085	0.038	9.275

The causal interaction between economic growth and terrorism was analyzed by Emirmahmutoğlu and Köse (2011) causality test in view of heterogeneity and cross-sectional dependence. The test can be employed in heterogeneous panel dataset with cross-sectional dependence and also be used when there exists no significant cointegration relationship among the variables under consideration. Emirmahmutoğlu and Köse (2011) causality test improved lag-augmented vector-autoregression (LA-VAR) approach, in which Toda and Yamamoto (1990) used to develop the Granger causality test for heterogeneous panels, with Meta analysis method by Fisher (1932). Toda and Yamaoto (1995) rests upon the modified Wald (MWALD) test statistics derived from a LA-VAR model with asymptotic chi-square distribution without requiring the pretests of stationarity and cointegration. The VAR model should be formed with p lag length and d_{\max} (maximum integration level). The Meta analysis method by Fisher (1932) is a statistical method to create a new test statistic through combining the multiple probability



values of the same hypothesis tests. Emirmahmutoğlu and Köse (2011) obtained a test statistic for heterogeneous panel by combining the cross-sectional MWALD statistics derived from LA-VAR model through Meta analysis method.

$$\lambda = -2 \sum_{i=1}^N \ln(p_i) \quad i = 1, 2, \dots, N \quad (1)$$

In the above equation, P_i indicates the probability values of cross-sectional Wald test statistics. Fisher test statistic adjusts chi-square distribution with $2N$ degrees of freedom, but this distribution is not valid in case of cross-sectional dependence. Therefore, Emirmahmutoğlu and Köse (2011) derives the critical values through bootstrapping.

The cross-sectional test statistics derived from VAR model with $k_i + d_{max_i}$.

$$x_{i,t} = \mu_i^x + \sum_{j=1}^{k_i+d_{max_i}} A_{11,ij} x_{i,t-j} + \sum_{j=1}^{k_i+d_{max_i}} A_{12,ij} y_{i,t-j} + u_{i,t}^x \quad (2)$$

$$y_{i,t} = \mu_i^y + \sum_{j=1}^{k_i+d_{max_i}} A_{21,ij} x_{i,t-j} + \sum_{j=1}^{k_i+d_{max_i}} A_{22,ij} y_{i,t-j} + u_{i,t}^y \quad (3)$$

In the above equation, d_{max_i} shows the maximum integration level for each i in the system. MWALD test, which is modified with k_i lag length considering the estimation results, is applied. The null hypothesis for equation 2 is that Y does not cause X (Emirmahmutoğlu and Köse, 2011).

4. Empirical Analysis

In the econometric analysis section of the article, the availability of cross-sectional dependence was investigated via LM, LM CD, and LM adj. tests and the test findings were denoted in Table 3. The null hypothesis (cross-sectional independence among cross-sections) was declined and the presence of cross-sectional dependence was revealed.


Table 3: Cross-sectional dependence tests

Test	Test statistic	P value
LM (Breusch and Pagan, 1980)	558.9	0.0000
LM CD (Pesaran, 2004)	14.85	0.0000
LM adj. (Pesaran et al., 2008)	43.65	0.0000

The availability of homogeneity was investigated via delta tilde tests of Pesaran and Yamagata (2008) and homogeneity test findings were denoted in Table 4. The null hypothesis (there exists homogeneity) was declined and the presence of heterogeneity was discovered.

Table 4: Homogeneity tests

Tests	Test statistic	P value
$\tilde{\Delta}$	8.718	0.000
$\tilde{\Delta}_{adj.}$	9.939	0.000

The stationarity of series of LNGDP and GTI was investigated via Pesaran (2007) CIPS (Cross-sectionally augmented IPS (Im- Pesaran-Shin (2003)) unit root test with cross-sectional dependency and unit test findings were denoted in Table 5. The unit root test findings pointed out that LNGDP and GTI were I(1).

Table 5: Results of CIPS panel unit root test

Variables	Constant	Constant + Trend
LNGDP	-1.333	-2.540
D(LNGDP)	-2.754***	-3.449***
GTI	-2.065	-2.510
D(GTI)	-3.219***	-3.357

*** it was significant at 1%.

The causal interaction between real GDP per capita and terrorism was investigated by Emirmahmutoğlu and Köse (2011) causality test and causality test findings were reported in Table 6. The causality analysis revealed a bilateral causality between terrorism and real GDP per capita at panel level. The country level causality findings disclosed a bilateral causality in Central African Republic and Mali, a unilateral causality from terrorism to real GDP per capita in Chad and Congo, Dem. Rep., and Zimbabwe. On the other side, a unilateral causality from real GDP per capita to terrorism was discovered in Niger, Nigeria, Rwanda, Senegal, South Africa, and Uganda.



Table 6: Causality test results

Country	GTI=>LNGDP	p-value	LNGDP=>GTI	p-value
Burundi	0.881	0.348	1.268	0.260
Central African Republic	4.803	0.091	7.874	0.020
Chad	3.506	0.061	0.180	0.672
Congo, Dem. Rep.	5.170	0.075	3.016	0.221
Cote d'Ivoire	0.998	0.607	1.451	0.484
Ethiopia	0.122	0.727	0.420	0.517
Kenya	1.358	0.507	2.408	0.300
Mali	38.890	0.000	16.065	0.000
Mozambique	2.425	0.297	2.618	0.270
Niger	3.532	0.171	60.521	0.000
Nigeria	0.648	0.421	4.460	0.035
Rwanda	4.303	0.116	8.904	0.012
Senegal	0.177	0.674	19.449	0.000
South Africa	0.239	0.625	7.790	0.005
Sudan	0.036	0.850	0.038	0.845
Tanzania	0.767	0.381	0.128	0.721
Uganda	0.698	0.403	9.540	0.002
Zimbabwe	12.189	0.002	2.988	0.224
Panel	89.538	0.000	164.246	0.000

A bilateral interaction between economic growth and terrorism is expected at theoretical terms. However, the causality direction between economic growth and terrorism can be changed depending on countries' economic and social development levels, unemployment, institutional development, poverty, and income inequality. Therefore, in the related empirical literature, different causality interactions between economic growth and terrorism have been revealed by Shahbaz et al. (2013), Bayar and Gavriletea (2018), Karadağ (2019), Zakaria et al. (2019), Saleem et al. (2020) and Gökce and Kaya (2021). Therefore, the findings of the article were found to be accordant with the relevant theoretical findings.

5. Conclusion

Terrorism has become a global problem that is difficult to predict for all countries. Terrorist incidents can negatively affect the countries through economic, social, political, financial and cultural aspects. Terrorism may lead to increases in defense expenditures, decreases in capital and negative impacts on the financial system through raising the insecurity and uncertainty level. Therefore, a shift of government expenditures from productive investments to security and defense expenditures can negatively influence economic growth through decreasing the investments in infrastructure, human and physical capital. On the other side, economic growth



also can feed the terrorism through channels of unemployment, poverty, income inequality, and shadow economy. As a consequence, a mutual interaction between economic growth and terrorism is expected.

In the study, the reciprocal interaction between economic growth and terrorism was explored in sample of Sub-Saharan African economies over the 2007-2019 period through Emirmahmutoğlu and Köse (2011) causality test. The causality test findings revealed a bilateral causality between economic growth and terrorism at panel level. On the other side, the findings of cross-sectional causality analysis pointed out a bilateral causality between economic growth and terrorism in Central African Republic and Mali, a unilateral causality from terrorism to economic growth in Chad and Congo, Dem. Rep., and Zimbabwe and unilateral causality from economic growth to terrorism in Niger, Nigeria, Rwanda, Senegal, South Africa, and Uganda. The interaction between economic growth and terrorism can vary depending on country specific characteristic such as economic development level, poverty and income inequality level, and institutional development and this theoretical expectation have been verified to a great extent by the related empirical literature. The interdependence between economic growth and terrorism should be considered in economic and counterterrorism policy-making process.

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