Ekonomik ve Sosyal Araştırmalar Dergisi

The International Journal of Economic and Social Research

2022, 18(1)

Economic Growth and Terrorism in the Middle East: A Heterogeneous Panel Causality Approach

Orta Doğu'da Ekonomik Büyüme ve Terörizm: Bir Heterojen Panel Nedensellik Yaklaşımı

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Geliş Tarihi (*Received*): 7 Nisan 2022 **Kabul Tarihi (*Accepted*):** 28 Nisan 2022 **Yayın Tarihi (*Published*):** 30 Haziran 2022

Abstract: This study aims to examine the relationship between terrorism and economic growth for a panel of fifteen Middle Eastern countries for the 2003-2019 period. Panel data analysis has the advantage of providing more information, more variability, and less collinearity in the data compared to single-country time series analysis. Besides this advantage, most of the cross-country panel data studies in the terrorism and economic growth literature assume that the terrorist activities are homogeneous across countries. We used the Dumitrescu-Hurlin panel causality test accounting for cross-sectional heterogeneity, which is widely ignored in most panel data studies on terrorism and economic growth nexus. Dumitrescu-Hurlin causality test results reveal in favor of a uni-directional causal relationship between terrorism and economic growth in the Middle East for the overall panel. We also find that this uni-directional relationship is ruled by the strong country-specific influence of Iraq.

Keywords: Middle East, Terrorism, Economic Growth, Panel Causality, Heterogeneity

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Öz: Bu çalışmanın amacı, 2003-2019 yılları arasını kapsayan dönem için on beş Orta Doğu ülkesi için terörizm ve ekonomik büyüme arasındaki ilişkiyi incelemektir. Panel veri analizi, tek ülkeli zaman serisi analizlerine kıyasla verilerde daha fazla değişkenlik, daha fazla bilgi ve daha az çoklu doğrusallık sağlama gibi avantajlar sağlamaktadır. Bu avantajlarına rağmen, terörizm ve ekonomik büyüme literatüründeki ülkeler arası panel veri çalışmalarının çoğu, terörist faaliyetlerin ülkeler arasında homojen olduğunu varsaymaktadır. Bu kapsamda, ekonomik büyüme ve terörizm arasındaki ilişkiyi inceleyen panel veri çalışmalarının pek çoğunda göz ardı edilen kesitler arası heterojeniteyi dikkate alarak Dumitrescu-Hurlin tarafından geliştirilen panel nedensellik analizi yapılmıştır. Analiz sonuçları, Orta Doğu'da terörizmden ekonomik büyümeye doğru tek yönlü bir nedensellik ortaya koymaktadır. Ülkeler bazında ayrıştırılmış nedensellik sonuçları ise, bu tek yönlü nedenselliğin, esas olarak Irak gibi terör faaliyetlerinin yoğun olduğu bir ülke tarafından domine edildiğini ortaya koymaktadır.

Anahtar kelimeler: Orta Doğu, Terörizm, Ekonomik Büyüme, Panel Nedensellik, Heterojenite

Atıf/Cite as: Ünsal, Y. & Çınar, İ. T. (2022). Economic Growth and Terrorism in the Middle East: A Heterogeneous Panel Causality Approach. *Ekonomik ve Sosyal Araştırmalar Dergisi*. 18(1). 17-27.

İntihal-Plagiarism/Etik-Ethic: Bu makale, en az iki hakem tarafından incelenmiş ve intihal içermediği, araştırma ve yayın etiğine uyulduğu teyit edilmiştir. / This article has been reviewed by at least two referees and it has been confirmed that it is plagiarism-free and complies with research and publication ethics. https://dergipark.org.tr/tr/pub/ijaws

Introduction

The word terror evokes the feeling of fear and horror in people's minds. Indeed, the word *"terrere*" in Latin means "to frighten" or "to dread" (Bolz et al., 2001; Fine, 2015). But today, the element of the political aim of terrorism has come into prominence and the use of violence, spreading fear in pursuit of a political aim has become the key factor of terrorism (Gençtürk, 2012: 3). Tavares (2004: 1042) states that the aims of

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terrorism can be classified under three different categories: publicity, destabilizing the polity, and damage to the economy.

Terrorist groups use violence as a medium to directly disturb social, political, and economic balances. In addition to its direct effects, terrorism also causes indirect effects resulting from the disturbance of economic activities, which may not be confined to the terrorized economy itself but may spread to other activities and economies (Brück, 2007). Abadie and Gardeazabal (2008) studied the effects of terrorist incidents on economies around the world and emphasized the four main impacts of terrorism from an economic perspective. First, terrorist attacks could lead to a decline in physical and human capital. Second, fear and violence create an uncertain environment for economic activities. Third, rising terrorist incidents concurrently could give a rise to security and defense expenditures. These expenditures will be compensated by shifting resources from productive sectors to less productive defense and security areas. The fourth impact of terrorism is on the tourism sector. Terror has a direct effect on some specific sectors such as tourism. The negative effects of terrorism on tourism will cause negative pressure on the economy as a whole.

Since the beginning of the 1960s, terrorism has likewise been a subject of concern for the United Nations (UN). But, it can be argued that terrorism has entered a new phase after the 9/11 attacks, and from this day forward, terrorism has acquired an international dimension (Conte, 2010). Notwithstanding, the Middle East is still one of the most terrorized and violent regions in the world. This study aims to investigate the likely relation between terrorism and economic growth in the Middle East using a panel causality test accounting for heterogeneity across countries. Panel data analysis has the advantage of providing more information, more variability, and less collinearity in the data compared to single-country time series analysis. Besides this advantage, most of the cross-country panel data studies in the terrorism and economic growth literature assume that the terrorist activities are homogeneous across countries. This assumption of homogeneity across countries is highly restrictive. Ignoring the heterogeneity across cross-sectional units in a panel framework can lead to biased conclusions. Studying the Middle East by employing a causality test accounting for cross-sectional heterogeneity is the main contribution of our study to the literature.

The rest of the study is organized as follows. Section 2 will shed light on the terrorism and growth literature. Section 3 will describe the data and the adopted methodology. Estimation results will be reported in Section 4. Finally, Section 5 will be based on conclusions.

Literature Review

Sandler and Enders (2008) claim that the literature on the economic consequences of terrorism began in 2003 and involves only a handful of studies. While some of these studies are dealing with the relationship between terrorist incidents and economic variables such as real gross domestic product (GDP), other studies are dealing with the case studies of countries. This study incorporates elements of both approaches.

Most of the studies in the growth and terrorism literature analyzed the relationship direction from terrorism to economic variables. For example, Blomberg et al. (2004) addressed the issue in 177 countries from 1968 to 2000. They found that terrorist incidents have negative impacts on countries' economic growth rates. But, the impact is slightly weaker for high-income countries especially for OECD countries, compared to developing counterparts. Negative effects of terrorism on the economic performance of countries are also shown in Barth et al. (2006). Their panel data analysis for the 1970-2003 period shows that terrorist incidents negatively affect economic growth. Similarly, Gaibulloev and Sandler (2009) investigated the effects of conflicts and terror incidents in Asia on per capita income for the 1970 and 2004 periods using panel data analysis. Their results reveal that transnational terrorist attacks restrict economic growth. The main reason behind this finding is the shift of government expenditures from productive areas to less productive defense and security. One interesting result of the study is that the developed countries are more successful in absorbing the negative economic impacts of terrorist activities, compared to developing

countries. Fatima et al. (2014) examined terrorism and economic growth relation in Pakistan and India from 2004 to 2010 by employing granger causality and cointegration analysis. According to them, terrorist activities have negative influences on the economic performances of both countries. Shahrestani and Anaraki (2008) take it from a broader perspective and analyzed the effects of terrorism on FDI, GDP, and total factor productivity (TFP) with a cross-sectional analysis for developed and less developed countries. They show that terrorism has adverse effects on growth, FDI, and TFP around the world. A more recent study by Bayar and Garviletea (2018) shows the harmful effects of terrorism on growth and reveals that a peaceful environment in the MENA countries positively affects growth performance. Another study for MENA countries by Şit and Karadağ (2019) also found that the uncertainty of an economy increases with the terrorist incidents, which reduces the accumulation of capital, and hence negatively affects GDP growth.

Besides all these studies, some researchers analyzed the effect from an opposite direction. That is to say, they studied the impact of economic variables on terrorism. An example among these studies is De Mesquita (2005). According to De Mesquita (2005), a recession in an economy affects terrorism in this country. But on the contrary, an opposite result has come from Choi (2015). He tried to investigate the contractionary effect of economic growth on terrorist incidents in 127 countries. But, they found no statistically significant effect. Another study is carried out by Gries et al. (2011). They investigated the effects of economic performance on terrorist incidents for a group of European countries. Two findings are worth mentioning in this study. First, the role of economic performance on terrorist activities is very crucial for some countries. Second, all terror-stricken countries managed to fulfill adjustments against the threat of terrorism.

Abadie and Gardeazabal's (2003) study is one of the best examples of the studies, that deal with the countries as a case study. Their study investigated the impact of conflicts on economic performance in the Basque Region. They also revealed that with the rise of conflicts and terror in the Basque Region, GDP per capita declined about 10%, compared to other regions. Another example of a good case study could be given from Turkey. Bilgel and Karahasan (2013), investigated the economic costs of terrorism in the eastern regions of Turkey. They found that after the emergence of PKK terror at the beginning of the 1980s, per capita GDP in both regions declined by 6.6%. A more recent study by Zakaria et al. (2019) for Pakistan reveals that the effect of terrorism on domestic and foreign direct investment and growth is negative. Another study for Pakistan was carried out by Saleem et al. (2020), which also shows the inverse relationship between terrorism and economic growth.

Data

We have two variables in this study. Both cover the 2003-2019 period for the fifteen Middle East countries[3]. Syria, one of the most affected countries by terrorist incidents in the region, is excluded from the sample due to the lack of appropriate Gross Domestic Product (GDP) data. Our first variable is Terrorism Index (TRR) which was released by the Institute for Economics and Peace (IEP). IEP considers and uses the information on the number of terrorist incidents that take place in a year, the number of casualties in a terrorist attack, and the characteristic of the terrorist attack. The Index takes values between 0 and 10. 0 is for the years that had been no terrorist incidents and 10 is for the years that terrorism intensely affects the people in a country. Another variable we used for our analysis is GDP at constant 2010 US Dollars (GDP). This variable is used as a proxy for Economic Growth and taken from the World Bank.

Empirical Analysis

The distribution of the average GDP and Global Terrorism Index values of the fifteen countries for the period between 2003 and 2019 has given in Figure 1. According to Figure 1, Bahrain, Kuwait, and Morocco

[3] Middle Eastern countries in our sample are Afghanistan, Algeria, Bahrain, Egypt, Iran, Iraq, Israel, Jordan, Kuwait, Lebanon, Morocco, Pakistan, Saudi Arabia, Tunisia, and Turkey.

are among the countries with the lowest average Index values. In addition, it is noteworthy that Afghanistan, which has the lowest GDP in our sample, is one of the countries with the highest Global Terrorism Index.

In panel (b) of Figure 1, it is noteworthy that Afghanistan's average growth rate between 2003 and 2019 is higher than other countries in the sample. In panel (b) of Figure 1 Iraq, as one of the countries with a high Global Terrorism Index, has a higher average GDP growth rate compared to other countries.

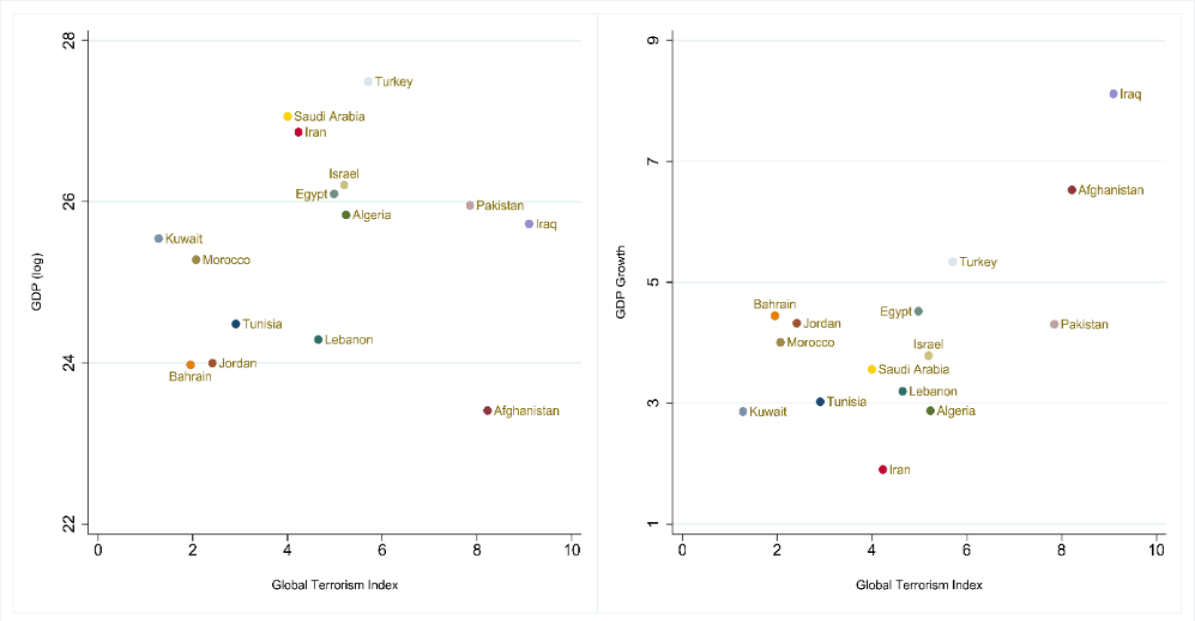

Figure 1: Average natural logarithm of GDP (panel a) and GDP growth (panel b) and Global Terrorism Index values of countries between 2003-2019

In Figure 2, the Global Terrorism Index and GDP over the years on a country basis have been given to visually reveal the movement between those two variables. In Algeria, Israel, and Morocco an inverse relationship between GDP and the Global Terrorism Index draws attention, while the relationship in Egypt, Jordan, Lebanon, and Tunisia is unclear. In Afghanistan, on the other hand, the relationship between GDP and the Global Terrorism Index shows a positive course.

In Figure 2, it is also noteworthy that the Global Terrorism Index values increase and decrease in different periods for different countries. This is a sign for the Middle Eastern countries that terrorist activities exhibit a cyclical structure and increase in times of political turmoil.

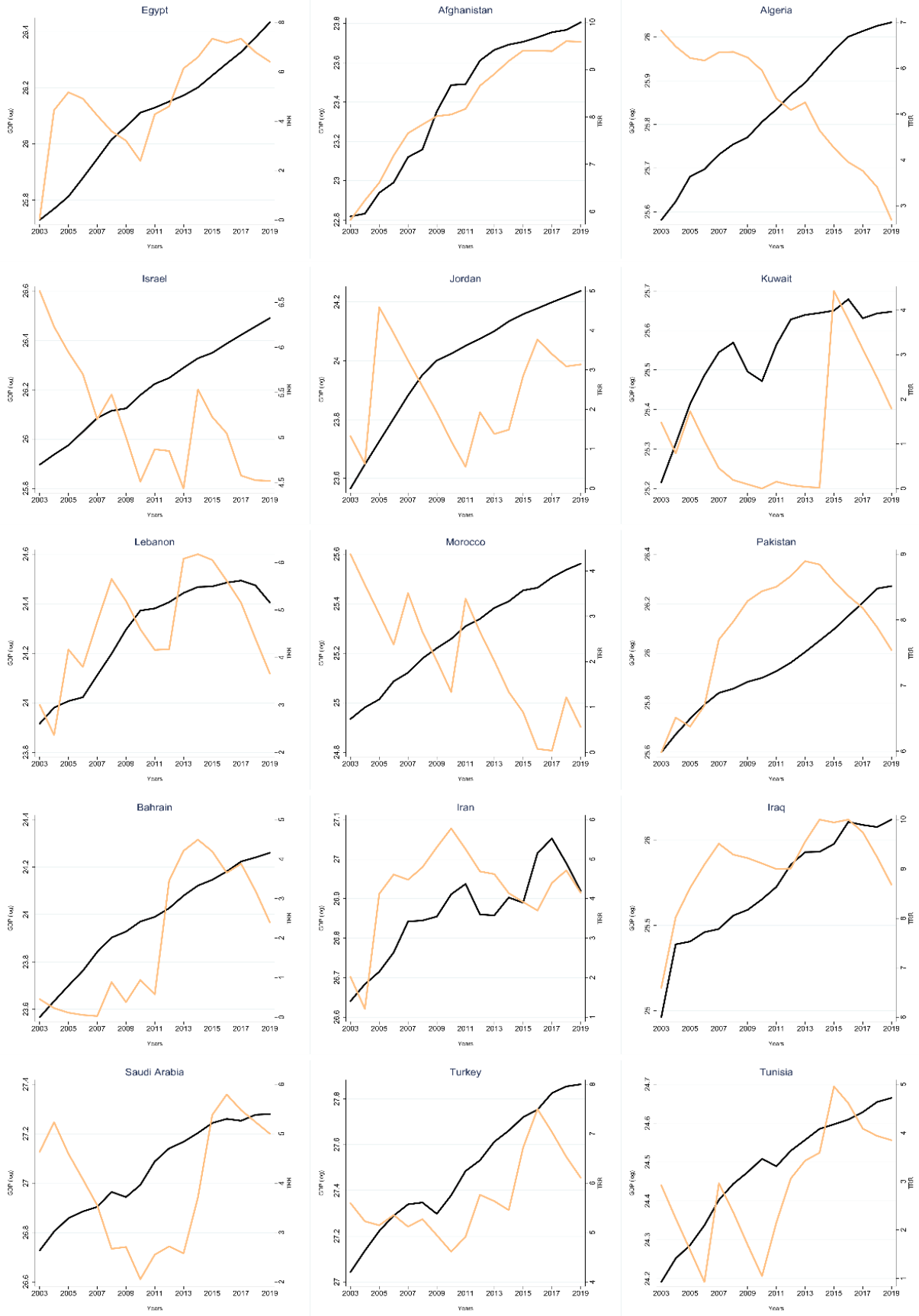

Figure 2: GDP-Global Terrorism Index values of countries by years (2003-2019)

Optimal Lag Length Selection

To analyze the causality between terrorism and economic growth following equation can be specified.

$$GDP_{i,t} = \alpha_{0i} + \gamma_i^{(k)} GDP_{i,t-k} + \beta_i^{(k)} TRR_{i,t-k} + u_{i,t}; \; i = 1,2,..,N : t = 1,2,..,T \quad (1)$$

To perform the Dumitrescu-Hurlin panel granger causality test, first, we need to choose the optimal lag order for our analysis. There are several criteria for choosing the optimal lag length in granger causality tests such as Akaike (AIC), Schwarz (SC), and Hannan-Quinn Information Criterion (HQ). Results for three information criteria are reported in Table 1 below.

Table 1: Optimal Lag Length Selection Criterion

Lag	AIC	SC	HQ
0	-1.4899	-1.4523*	-1.4747
1	-1.5304*	-1.4175	-1.4846*
2	-1.4862	-1.2979	-1.4097
3	-1.4912	-1.2277	-1.3843
4	-1.4650	-1.1262	-1.3275
5	-1.4533	-1.0392	-1.2852
6	-1.4690	-0.9796	-1.2703

Information criterion is the initial measure that can be adopted when selecting the appropriate lag length in a time series analysis. However, we can get conflicting conclusions regarding the lag length when these criteria are used. According to Table 1, while AIC and HQ choose lag order of 1 as the optimal lag length, SC yields zero lag length as the optimal lag. From the test results in Table 1, we employed the Dimutrescu-Hurlin granger causality test for 1 lag.

After determining the optimal lag order, we employed Pesaran's (2004) CD_{LM} test to test for dependency across cross-sections. After that, series stationarity was investigated by using the Cross-Sectionally Augmented Im-Pesaran-Shin (CIPS) stationarity test. Finally, we used the panel causality test developed by Dumitrescu and Hurlin (2012) for analysis between terrorism and economic growth.

Cross-Section Dependency Test

As Chudik and Pesaran (2013) noted ignoring cross-sectional dependence can have serious consequences for the panel data analysis. It is important to check for the cross-section dependency in a panel setting in the sense that it affects the whole course of the study. If there exists a cross-sectional dependence in the series, one will have to use second-generation unit root tests allowing for cross-sectional dependency. Otherwise, first-generation unit root tests have to be employed. Breusch and Pagan's (1980) CD_{LM1} test and Pesaran's (2004) CD_{LM2} tests can be used where the time dimension (T) of panel data is greater than the cross-sectional dimension (N). That is to say if $T>N$. Since our time dimension T, is greater than cross-sectional dimension N, we used Breusch-Pagan (1980) CD_{LM1} test. Related results are given in Table 2.

Table 2: Breusch-Pagan CD_{LM1} Test Results

Variables	Test statistic	Prob.
GDP	1748.245	0.000
TRR	650.405	0.010

H_0: No cross-section dependency.

From Table 2, we can see that the null hypothesis should be rejected, and thus, it can be concluded that there exists cross-sectional dependency in the series. This also indicates that a shock on a middle eastern country has effects on other middle eastern countries.

Test for Panel Based Unit Root

As we noted earlier, in the presence of cross-section dependency in the series, one has to use the second generation unit root test. In this respect, we used Cross-Sectionally Augmented Im-Pesaran-Shin (CIPS) unit root test value for the overall panel, which shows the arithmetic mean of the Pesaran's (2007) CADF test statistics. CIPS can be defined as

$$CIPS = \frac{1}{N}\sum_{i=1}^{N} CADF_i \tag{2}$$

The null hypothesis for the CIPS test is that the series is not stationary. Results for CIPS tests are given in Table 3.

Table 3: CIPS Panel Unit Root Test Results

		Critical Values		
Variable	*Statistics Value*	%1	%5	%10
GDP	-1.407	-2.47	-2.26	-2.14
TRR	-2.191	-2.47	-2.26	-2.14
		Critical Values		
Variable	*Statistics Value*	%1	%5	%10
GDP2	-3.366	-2.47	-2.26	-2.14
TRR2	-3.791	-2.47	-2.26	-2.14

** No trend with a constant model has been employed.*

CIPS test results in Table 3 show us that *GDP* and *TRR* series are not stationary at their levels for 5% critical value. Therefore, we used the annual percentage growth of *GDP* (*GDP2*) and the first difference of *TRR* (*TRR2*) of the series for the panel causality test. The bottom side of Table 3 shows the CIPS test statistics for *GDP2* and *TRR2* variables stationary for 1% critical value.

Test for Panel Causality

The last phase of our analysis comprises a panel causality test developed by Dumitrescu and Hurlin (2012). This test is suitable for both *N>T* and *T>N* cases and allows for cross-sectional dependency. Dumitrescu and Hurlin's (2012) test proposes the Homogeneous Non-Causality (HNC) hypothesis. HNC hypothesis assumes that there is no causal relationship for any of the panel units. It can be defined as follows:

$$H_0 : \beta_i = 0, \quad \forall_i = 1, 2, ...N \tag{3}$$

β_i continues as $\beta_i = (\beta_i^{(1)}, \beta_i^{(2)} ..... \beta_i^{(k)})$ and it can change across groups. This also shows the null hypothesis of the Dumitrescu and Hurlin (2012) panel causality test. The alternative is the Heterogeneous Non-Causality Hypothesis (HENC). The alternative hypothesis is allowed for two subgroups of cross-sections. One with a causal relationship and the other with no causality.

$$\begin{aligned} H_1 &: \beta_i = 0, \quad \forall_i = 1, 2, ...N_1 \\ &\beta_i \neq 0, \quad \forall_i = N_1 + 1, ..., N \end{aligned} \tag{4}$$

Equation (4) shows the alternative hypothesis. Where N_1 is unknown and satisfies the $0 \leq N_1/N < 1$ condition. To test the null hypothesis, Dumitrescu and Hurlin (2012) proposed a Wald statistic (W) for each cross-section and also for the overall panel framework. Z^{HNC} statistics based on the Wald statistics are as follows.

$$Z_{N,T}^{HNC} = \sqrt{\frac{N}{2K}}(W_{N,T}^{HNC} - K) \quad (5)$$

$$Z_{N}^{HNC} = \frac{\sqrt{N\left[W_{N,T}^{HNC} - N^{-1}\sum_{i=1}^{N} E(W_{i,T})\right]}}{\sqrt{N^{-1}\sum_{i=1}^{N} Var(W_{i,T})}} \quad (6)$$

In Equations (5) and (6); N and T represent the number of cross-sectional units and time periods, respectively. Besides, $W_{i,T}$ is the individual Wald statistics for i^{th} cross-section; E, is the expected value, and *Var* represents the variance.

$N,T \to \infty$ and in equation (6) T is fixed. More detailed explanations and information about the test statistics can be found in Dumitrescu and Hurlin (2012).

Table 4: Dumitrescu-Hurlin (2012) Panel Causality Test Results (1 lag)

Null Hypothesis		Z_N^{HNC}		
		Wbar Statistic	Zbar Tilde Statistic	Probability
TRR2 does not Granger-cause GDP2.	TRR2 > GDP2	2.297	2.239	(0.025)*
GDP2 does not Granger-cause TRR2.	GDP2 > TRR2	0.809	-0.746	(0.455)

*Probabilities are given in parentheses. * shows the causality relationship between variables at 5% significance level.*

According to Table 4, we can see that there is a uni-directional causality from terrorism to economic growth for the overall panel. This result implies that terrorist incidents are important to determine economic growth in the Middle East for the period considered in the study. In addition to this result, we also examined the country-specific causalities. Table 5 investigates the causal relationship between terrorism and economic growth specific to each country.

Table 5: Causality Test Results for each Middle Eastern Country

$TRR \Leftrightarrow GDP$	$GDP \Rightarrow TRR$	$TRR \nLeftrightarrow GDP$	$TRR \Rightarrow GDP$
---	Egypt*	Afghanistan Algeria Iran Jordan Kuwait Lebanon Morocco Pakistan Saudi Arabia Tunisia Turkey Bahrain	Iraq*** Israel**

$^*p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

As it can be seen from Table 5, there seems no causal relationship for all countries except for Iraq, Israel, and Egypt. While causal relation turns out to be from economic growth to terrorism in Egypt, in Iraq and

Israel the relation is from terrorism to economic growth as in the overall panel results. This relationship seems particularly evident for Iraq. It is also worth mentioning that, a bi-directional causal relationship does not exist for countries in the middle east.

Conclusion

This study intended to reveal the causality between growth and terrorism in the Middle East, where the effects of terrorist violence are felt most strongly. We first investigated the existence of dependency or correlation among the cross-sections in the series, then we employed a unit root test allowing for cross-sectional dependency. Finally, we used Dumitrescu and Hurlin's (2012) panel causality test to analyze the causal relationship for a panel of fifteen Middle Eastern countries by allowing for heterogeneity across countries, which is widely ignored in most empirical cross-country panel studies in the literature.

We found that there is a uni-directional causality from terrorism to economic growth for the overall panel. The findings of this study show us that terrorism in the Middle East affects the economic performance of the region. Our findings are in line with the recent studies of Şit and Karadağ (2019) for MENA countries that reveal the negative effect of terrorism on economic growth and also support the findings of Blomberg et al. (2004). However, our study differs from these studies by examining heterogeneous country-specific panel causality results. In this regard, some country-specific results are worth mentioning. First of all, 12 out of 15 countries do not yield a causal relationship, while only two countries namely Iraq and Israel show a causal relationship between terrorism and economic growth. This country-specific relation is especially evident in Iraq. Strong causality for Iraq, along with Israel, seems to affect the overall panel causality results.

With the onset of the Arab Spring, the political and economic instability in the Middle East countries has increased. Looking from 2003 to the present, it is seen that the deadliest terrorist attacks took place in this region. The activities of the ISIS terrorist organization in Iraq and Syria caused the global terrorism index to reach the highest levels in the Middle East. The insecure environment in Iraq and Syria, causes investment plans to be postponed or canceled in the whole region. In addition, countries struggling with the insecure environment have to shift their resources to defense and military areas instead of productive areas such as education, health, and achieving a fairer income distribution. All these developments negatively affect the dynamics of economic growth in the Middle East.

Obviously, our findings do not overlap with the whole literature. When accounting for cross-sectional dependency and heterogeneity across countries, contrary to the findings of Bayar and Gavriletea (2019), we found no bi-directional relationship for the whole panel and also for countries separately in the Middle East. In this regard, our results should be supported or rejected by new studies for different periods and countries accounting for more realistic assumptions of heterogeneity across countries.

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