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Human Development, Main Macroeconomic Variables and Terrorism in Middle East and North Africa: A Panel Causality Analysis *

Ortadoğu ve Kuzey Afrika'da İnsani Gelişme, Temel Makroekonomik Değişkenler ve Terörizm: Bir Panel Nedensellik Analizi

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ÖZ

Son yıllarda terörizm ile mücadelede ilerlemeler kaydedilmesine rağmen, terörizm hala birçok ülke için ciddi bir sorundur. İlgili literatürde çok sayıda kurumsal, ekonomik ve sosyal faktör terörizmin olası nedenleri olarak tespit edilmiştir. Bu çalışmada yatay kesit bağımlılığını dikkatte alan nedensellik testi kullanılarak 2005-2019 döneminde orta Doğu ve Kuzey Afrika ülkelerinde insani gelişme, kişi başına GSYİH, işsizlik ve genç işsizilik ve enflasyon temel makro ekonomik değişkenleri ile terörizm arasındaki karşılıklı etkileşimi araştırılmıştır. Nedensellik analizi sonucunda insani gelişme, işsizlik, genç işsizlik, enflasyon ve terörizm arasında karşılıklı bir etkileşim ve kişi başına düşen reel GSYİH'den terörizme doğru tek yönlü bir nedensellik ilişkisi tespit edilmiştir.

Anahtar Kelimeler: İnsani gelişme, kişi başına düşen reel GSYİH, işsizlik, enflasyon, Orta Doğu ve Kuzey Afrika ülkeleri, panel nedensellik analizi.

ABSTRACT

Terrorism has still a serious problem for many countries despite the improvements in combat with terrorism during the recent years. Many institutional, economic, and social factors have been documented as the possible causes of terrorism in the related literature. This research explores the reciprocal interaction between human development, main macroeconomic variables of real GDP per capita, unemployment, youth unemployment, and inflation and terrorism in Middle East and North African countries over the 2005-2019 period through causality analysis with cross-sectional dependence and heterogeneity. The causality analysis discovered a reciprocal interaction between human development, unemployment, youth unemployment, inflation and terrorism and a significant causality from real GDP per capita to the terrorism.

Keywords: Human development, real GDP per capita, unemployment, inflation, Middle East and North African countries, panel causality analysis.

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1. INTRODUCTION

The researchers have not reached a consensus about the definition and components of terrorism yet. In this study, terrorism is accepted 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" by Institute for Economics & Peace (2020). Terrorism has significant immediate impacts including deaths, disability, injuries, destructions in infrastructure, public and private property and side psychological, social and economic impacts. Therefore, decreasing the terrorist activities is among the priorities at national and international level. The deaths caused by terrorism fell to 13,826 deaths in 2019 as the result of the last fifth consecutive year fall and the global economic cost of terrorism was US$26.4 billion in 2019 (Institute for Economics & Peace, 2020). In other words, the terrorism is on the downward trend in the world. However, terrorism is still a serious problem for many countries and the world. Therefore, specification of factors underlying the terrorism is important for combat with terrorism.

In this paper, we focus on the mutual interaction among human development, main macroeconomic variables and terrorism in sample of MENA (Middle East and North Africa) region, which is one of the regions considerably exposed to the terrorism in the world. In this context, terrorism can negatively affect the economic growth through damaging the human and physical capital, infrastructure, economic and political stability together with physical damages and casualties. Furthermore, terrorism may decrease the domestic and foreign investments, trade, and tourism receipts by decreasing the security and increasing the uncertainty and psychological side effects (Bayar and Gavriletea, 2018). On the other hand, poor socio-economic performance such as slow economic growth, widespread unemployment, poverty, and income inequality can also make a contribution to the environment which terrorism and terrorists emerge (Freytag et al., 2010). So, a mutual interaction between human development and terrorism is theoretically expected.

Furthermore, terrorism can negatively affect the human development through human life and security and preventing the persons' access to the services such as education and health (Mahmud, 2020). On the other side, the countries with higher level of human development can generally experience very low terrorism, because the people with higher level of education, wellbeing, and health generally keep away from terrorism. So, a mutual interaction between human development and terrorism is also expected at theoretical terms.

In the research, we analyze the mutual interaction among human development, major macroeconomic variables, and terrorism in MENA region for the period of 2005-2019 through causality analysis regarding cross-sectional dependence and heterogeneity. The related literature has generally focused on the impact of terrorism on economic growth and human development and the impact of human development and economic factors on the terrorism has mainly disregarded. Therefore, the paper aims to make a contribution to the relevant literature analyzing the reciprocal interaction between terrorism and the aforementioned factors. In this context, the empirical literature was summarized in the next part of the paper. Then, dataset and method were described and empirical analysis was conducted. The study was over with Conclusions.

2. LITERATURE REVIEW

The determinants of terrorism have been explored for different countries and panels of countries in the related literature and socio-economic factors such as real GDP per capita, unemployment, inflation, poverty, income inequality, schooling rate, and literacy rate together with government size, human and physical capital investments, defense expenditures, political stability, political repression, political rights have been documented as the main significant factors underlying the terrorism.

In this context, Freytag et al. (2010) explored the socio-economic factors underlying terrorism over the period 1971-2005 through a negative binomial regression analysis and discovered a negative effect of real GDP per capita, government size, and population on the terrorism. On the other hand, Feridun and Shahbaz (2010) analyzed the causality between terrorism and defense expenditures through ARDL approach and Granger causality test and revealed a significant causality from terrorist attacks to the defense expenditures. Nasir et al. (2011) also analyzed the determinants of terrorism in selected south Asian economies through negative binomial regression found that relative deprivation, political repression, and literacy rate were significant determinants of terrorism.

Yildirim and Öcal (2013) researched the factors underlying terrorism in Turkey over the 1990–2006 duration through regression analysis and income and schooling rate decreased the terrorism, but unemployment raised the terrorism. On the other hand, Shahbaz (2013) analyzed the interaction among economic growth, inflation, and terrorism in Pakistan over the 1971–2010 duration through ARDL approach and revealed that inflation positively affected the terrorism, but economic growth negatively affected the terrorism. Furthermore, he discovered a bilateral causality between terrorism and inflation.

Meierrieks and Gries (2013) explored the causality between economic growth and terrorism in 160 countries over the 1970-2007 duration through causality analysis and discovered a changing relationship between economic growth and terrorism over time and across the countries. Ismail and Amjad (2014) explored the factors underlying the terrorism in Pakistan over the 1972-2011 period through Johansen cointegration and discovered that GDP per capita, inflation, poverty, and political rights were significant short-term determinants of terrorism and GDP per capita, inflation, poverty, and literacy rate were significant long-term determinants of terrorism.

Enders et al. (2016) explored the interaction between real GDP per capita and terrorism in countries with different income levels during the 1970-2010 period through nonlinear smooth transition regression analysis and discovered a nonlinear interaction between two variables. Khan et al. (2018) explored the impact of terrorism and economic growth on human

development in Pakistan for the period of 1990-2016 through ARDL approach and revealed that terrorism negatively affected the human development. On the other side, Nurunnabi and Sghaier (2018) explored the interaction between terrorism and socioeconomic variables in Tunisia over the 1979–2015 duration through ARDL approach and reached that unemployment, political instability, shadow economy size and higher school enrollment rates positively affected the terrorism, but GDP per capita and foreign direct investments negatively influenced the terrorism.

Ozcan and Karter (2020) analyzed the mutual interaction among terrorism, economic growth, and human development in 12 MENA countries over the 2002-2017 period and revealed a bilateral causality between terrorism and human development. Lastly, Tahir (2020) researched the causes behind the terrorism in 94 countries over the 2005-2016 duration and discovered that low per capita income and political instability were the main factors underlying the terrorism and human and physical capital also decreased the terrorism, but government consumption and inflation raised the terrorism. Furthermore, military expenditures had a negative impact on terrorism in Muslim countries and positive impact on terrorism in non-Muslim countries and a discovered a bilateral causality between terrorism and variables of economic growth, physical capital stock growth, government consumption, corruption, inflation and political instability.

3. DATA AND ECONOMETRIC METHODOLOGY

In the research, the reciprocal interaction between human development, main macroeconomic variables of real GDP per capita, unemployment, youth unemployment, inflation and terrorism were analyzed through panel causality test with cross-sectional dependence and heterogeneity test. In the econometric analysis, terrorism was proxied by the GTI (Global Terrorism Index) of the Institute for Economics & Peace (2021) and human development was proxied by HDI (human development index) of UNDP (United Nations Development Programme) (2021). On the other hand, real GDP per capita was proxied by GDP per capita (constant 2010 US$); unemployment and youth unemployment were respectively represented by total unemployed as a percent of total labor force and the share of the labor force ages 15-24 as a percent of total labor force ages 15-24. Lastly, inflation was proxied by average consumer prices in terms of percent change. The GTI takes a value between 0 and 10 (higher values mean a higher terrorism level) and HDI takes a value between 0 and 1 (higher values mean a higher development level). GTI was obtained from Institute for Economics & Peace (2021), HDI was provided from UNDP (2021) and inflation data was acquired from IMF (2021) and the variables of real GDP per capita, unemployment, and youth unemployment were obtained from World Bank database as seen in Table 1. Furthermore, all the series were annual and study period was specified as 2005-2019 given the presence of GTI data.

Table 1. Dataset description.

Variables	Variable description	Data source
GTI	Global terrorism index	Institute for Economics & Peace (2021)
HDI	Human development index	UNDP (2021)
GDP	GDP per capita (constant 2010 US$)	World Bank (2021a)
UNEMP	Unemployment, total (% of total labor force) (modeled ILO estimate)	World Bank (2021b)
YUNEMP	Unemployment, youth total (% of total labor force ages 15-24) (modeled ILO estimate)	World Bank (2021c)
INF	Inflation, average consumer prices (%)	IMF (2021)

The study sample consisted of Algeria, Egypt, Iran, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Saudi Arabia, Tunisia, and Yemen from MENA region considering World Bank (2021d), but Bahrain, Djibouti, Oman, Qatar, Syria, United Arab Emirates, and West Bank and Gaza were not included in the sample due to data non-existence. The study duration was specified as 2005-2019 because the GTI data existed for 2005-2019 period. We utilized the software packages of EViews 10.0 and Stata 14.0 to conduct the empirical analyses.

The dataset's main characteristics were shown in Table 2. The average of global terrorism index was 4.29 in the sample during the study period, but considerably changed among the countries. On the other side, the average of human development index, real GDP per capita, unemployment, youth unemployment and inflation were respectively 0.7, USD 8838.57, 10.66%, 26.39%, and 7.21%. However, real GDP per capita, unemployment, youth unemployment, and inflation significantly changed among the countries.

Table 2. Summary statistics of the dataset

Variables	Mean	Std. Deviation	Minimum	Maximum
GTI	4.291828	2.545176	0	10
HDI	0.7085278	0.0884931	0.467	0.859
GDP	8838.572	10763.72	631.4879	49578.5
UNEMP	10.66511	4.394708	1.3	19.05
YUNEMP	26.38922	9.527492	7.31	49.94
INF	7.217283	8.572533	-3.696	53.248

The causal interaction among human development, major macroeconomic variables, and terrorism was analyzed by the causality test of Emirmahmutoğlu and Köse (2011). The Emirmahmutoğlu ve Köse (2011) causality test is the extended version of Toda-Yamamoto (1995) causality test for the heterogeneous panel data and also regards the presence cross-sectional dependency. Therefore, the test does not require the series to be stationary. So, it can be used with both I (0) and I(1). Furthermore, the test can be applied in case of significant or insignificant cointegration relationship among the series (Emirmahmutoğlu and Köse, 2011).

Emirmahmutoğlu and Köse (2011) causality test allows the lag length to differentiate for each cross-section and decreases the long term information loss because it models the series with level values (Emirmahmutoğlu and Köse, 2011; Toda and Yamamato, 1995). The test can be expressed with the following equation:

$$Y = \varphi_{\mathrm{I}}^{Y} + \sum_{k=1}^{k_i+d_{max_i}} A_{11,ik} Y_{it-k} + \sum_{k=1}^{k_i+d_{max_i}} A_{12,ik} X_{it-k} + \mu_{\mathrm{I},T}^{X}$$

$$X = \varphi_{\mathrm{I}}^{X} + \sum_{k=1}^{k_i+d_{max_i}} A_{21,ik} Y_{it-k} + \sum_{k=1}^{k_i+d_{max_i}} A_{22,ik} X_{it-k} + \mu_{\mathrm{I},T}^{UNEMP} \quad (1)$$

In the above equation, k represents the lag length, d_{max} is the maximum integration level for each country. The rejection of $H_0: \sum_{k=1}^{k_i} A_{12} = 0$ shows that unemployment is Granger cause of population aging. On the other side, the rejection of $H_0: \sum_{k=1}^{k_i} A_{21} = 0$ indicates that population aging is Granger cause of unemployment. The country level probability values (p_i) is aggregated considering Fisher (1932) and in turn panel level probability value of the causality analysis is obtained. Fisher (1932) test statistic obeys the chi-square distribution with 2N degree of freedom, but critical values for cross-section level causality analysis are derived from bootstrapping.

4.EMPIRICAL ANALYSİS

The presence of cross-sectional dependence and heterogeneity was firstly examined in the applied part of the study. In this context, Pesaran et al. (2008) LM adj. test, Pesaran (2004) LM CD test and Breusch and Pagan (1980) LM test were conducted to analyze the cross-sectional dependence and the test findings were shown in Table 3. The null hypothesis of cross-sectional independence was declined at 1% level given the test findings and a significant cross-sectional dependence among the series was reached.

Table 3. Cross-sectional dependence test'results.

Test	Test Statistic	P value
LM adj*	285	0.0000
LM CD*	46.77	0.0000
LM	15.68	0.0000

*two-sided test

The heterogeneity presence of cointegration coefficients was checked by delta tilde tests of Pesaran and Yamagata (2008) and the test findings were shown in Table 4. The null hypothesis of homogeneity was declined at 1% given the test findings and the presence of heterogeneity was reached.

Table 4. Homogeneity tests' results

Test	Test Statistic	P value
$\tilde{\Delta}_{adj.}$	5.389	0.000
$\tilde{\Delta}$	6.110	0.000

The stationarity of the series was checked with Pesaran (2007) CIPS (Cross-sectionally augmented IPS (Im- Pesaran-Shin (2003)) test given the presence of cross-sectional dependence and test findings were shown in Table 5. All the series were revealed not to be stationary at their levels, but became stationary with first differenced values.

Table 5. CIPS birim kök testi sonuçları.

Variables	Constant	Constant + Trend
GTI	-1.184	-0.355
d(GTI)	-2.140**	-2.269**
HDI	1.112	1.471
d(HDI)	-0.809**	0.215**
GDP	0.146	1.704
d(GDP)	-1.204**	-1.033**
UNEMP	0.250	1.867
d(UNEMP)	-1.958**	-2.952**
YUNEMP	-1.207	0.255
d(YUNEMP)	-2.525***	-0.892***
INF	0.267	-1.271
d(INF)	-3.279***	-1.073***

** and *** respectively indicated that it was significant at 5% and 1% levels.

The mutual interaction between human development and terrorism was analyzed through Emirmahmutoğlu and Kose (2011) causality test taking notice of cross-sectional dependence and heterogeneity and the test findings were shown in Table 6. The causality analysis pointed out a significant mutual interaction between human development and terrorism at panel level in compatible with theoretical expectations. On the other side, the country level causality analysis denoted a significant causality from human development to the terrorism in Iran and Libya, a significant causality from terrorism and human development in Jordan and Tunisia. The findings were found to be compatible with theoretical expectations and the findings of Tahir (2020) and Ozcan and Karter (2020).

Table 6. Emirmahmutoğlu and Kose (2011) causality test results

Countries	HDI ↛ GTI		GTI↛HDI	
	Test statistic	P value	Test statistic	P value
Algeria	2.347	0.126	0.187	0.665
Egypt	0.380	0.944	7.720	0.052
Iran	**19.325**	**0.000**	3.295	0.348

Countries	HDI ↛ GTI		GTI↛HDI	
	Test statistic	P value	Test statistic	P value
Iraq	0.001	0.971	0.444	0.505
Jordan	0.957	0.620	**5.056**	**0.080**
Kuwait	1.346	0.246	0.485	0.486
Lebanon	1.005	0.800	0.764	0.858
Libya	**18.641**	**0.000**	5.437	0.142
Morocco	0.458	0.499	0.037	0.847
Saudi Arabia	0.354	0.552	1.876	0.171
Tunisia	0.760	0.859	**628.900**	**0.000**
Yemen	3.986	0.136	0.077	0.962
Panel	**48.189**	**0.002**	**647.746**	**0.000**

The mutual interaction between real GDP per capita and terrorism was analyzed through Emirmahmutoğlu and Kose (2011) causality test taking notice of cross-sectional dependence and heterogeneity and the test findings were shown in Table 7. The causality analysis pointed out a significant causality from real GDP per capita to the terrorism at panel level. Therefore, economic development level was a significant determinant of terrorism. On the other side, the country level causality analysis denoted a significant causality from real GDP per capita to the terrorism in Libya and Saudi Arabia, and Yemen and a significant causality from terrorism and real GDP per capita in Lebanon, and bilateral causality between real GDP per capita and terrorism in Yemen. The findings were found to be compatible with theoretical expectations and the findings of Freytag et al. (2010), Yildirim and Öcal (2013), Shahbaz (2013), Nurunnabi and Sghaier (2018), and Tahir (2020).

Table 7. Emirmahmutoğlu and Kose (2011) causality test results

Countries	GDP ↛ GTI		GTI↛GDP	
	Test statistic	P value	Test statistic	P value
Algeria	0.118	0.732	0.136	0.712
Egypt	0.628	0.890	0.393	0.942
Iran	1.122	0.290	0.217	0.641
Iraq	3.799	0.150	0.381	0.826
Jordan	0.840	0.657	0.550	0.760
Kuwait	0.112	0.738	0.000	0.991
Lebanon	3.825	0.281	**6.705**	**0.082**
Libya	**41.445**	**0.000**	1.206	0.751
Morocco	1.834	0.400	0.226	0.893
Saudi Arabia	**24.175**	**0.000**	1.179	0.758
Tunisia	3.766	0.288	3.220	0.359
Yemen	**11.061**	**0.011**	**7.240**	**0.065**
Panel	**83.885**	**0.000**	16.519	0.868

The mutual interaction between unemployment and terrorism was analyzed through Emirmahmutoğlu and Kose (2011) causality test taking notice of cross-sectional dependence and heterogeneity and the test findings were shown in Table 8. The causality analysis pointed out a significant mutual interaction between unemployment and terrorism at panel level in compatible with theoretical expectations. On the other side, the country level causality analysis denoted a two-way causality between

unemployment and terrorism in Morocco and Yemen, a significant causality from unemployment to the terrorism in Tunisia, and a significant causality from terrorism and unemployment in Iraq, Jordan and Saudi Arabia. The findings were found to be compatible with the findings of Yildirim and Öcal (2013), Nurunnabi and Sghaier (2018).

Table 8. Emirmahmutoğlu and Kose (2011) causality test results

Countries	**UNEMP ↛ GTI**		**GTI↛UNEMP**	
	Test statistic	**P value**	**Test statistic**	**P value**
Algeria	5.429	0.143	17.353	0.001
Egypt	1.507	0.471	0.270	0.874
Iran	0.304	0.582	0.839	0.360
Iraq	2.018	0.569	**13.268**	**0.004**
Jordan	0.687	0.407	**3.624**	**0.057**
Kuwait	0.983	0.805	1.065	0.785
Lebanon	3.693	0.297	1.238	0.744
Libya	3.415	0.181	0.121	0.941
Morocco	**183.708**	**0.000**	**32.228**	**0.000**
Saudi Arabia	0.172	0.917	**5.312**	**0.070**
Tunisia	**13.784**	**0.003**	2.091	0.554
Yemen	**13.972**	**0.003**	**7.804**	**0.050**
Panel	**217.931**	**0.000**	**76.707**	**0.000**

The mutual interaction between youth unemployment and terrorism was analyzed through Emirmahmutoğlu and Kose (2011) causality test taking notice of cross-sectional dependence and heterogeneity and the test findings were shown in Table 9. The causality analysis pointed out a significant mutual interaction between youth unemployment and terrorism at panel level in compatible with theoretical expectations. On the other side, the country level causality analysis denoted a significant causality from youth unemployment to the terrorism in Libya, Morocco, Tunisia, and Yemen, and a significant causality from terrorism and youth unemployment in Jordan, Kuwait, and Saudi Arabia and a bilateral causality between youth unemployment and terrorism in Algeria.

Table 9. Emirmahmutoğlu and Kose (2011) causality test results

Countries	**YUNEMP ↛ GTI**		**GTI↛YUNEMP**	
	Test statistic	**P value**	**Test statistic**	**P value**
Algeria	**3.104**	**0.078**	**4.047**	**0.044**
Egypt	1.633	0.201	0.827	0.363
Iran	0.515	0.473	0.001	0.977
Iraq	2.306	0.511	6.234	0.101
Jordan	0.434	0.510	**3.881**	**0.049**
Kuwait	0.943	0.332	**5.585**	**0.018**
Lebanon	0.863	0.834	2.700	0.440
Libya	**13.087**	**0.004**	0.703	0.873

Countries	YUNEMP ↛ GTI		GTI↛YUNEMP	
	Test statistic	P value	Test statistic	P value
Morocco	**11.757**	**0.003**	0.346	0.841
Saudi Arabia	3.099	0.212	**8.994**	**0.011**
Tunisia	**6.608**	**0.086**	1.940	0.585
Yemen	**14.523**	**0.002**	5.134	0.162
Panel	**57.837**	**0.000**	**42.920**	**0.010**

The mutual interaction between inflation and terrorism was analyzed through Emirmahmutoğlu and Kose (2011) causality test taking notice of cross-sectional dependence and heterogeneity and the test findings were shown in Table 10. The causality analysis pointed out a significant mutual interaction between inflation and terrorism at panel level. On the other side, the country level causality analysis denoted a bilateral causality between inflation and terrorism in Algeria and Iran, a significant causality from inflation to the terrorism in Lebanon, Morocco, and Yemen, and a significant causality from terrorism to the inflation in Kuwait. The findings were consistent with the findings of Shahbaz (2013), and Tahir (2020).

Table 10. Emirmahmutoğlu and Kose (2011) causality test results

Countries	INF ↛ GTI		GTI↛INF	
	Test statistic	P value	Test statistic	P value
Algeria	**14.426**	**0.002**	**6.305**	**0.098**
Egypt	4.629	0.201	5.699	0.127
Iran	**11.590**	**0.009**	**15.218**	**0.002**
Iraq	0.264	0.967	1.088	0.780
Jordan	0.364	0.546	0.371	0.542
Kuwait	2.585	0.460	**10.570**	**0.014**
Lebanon	**8.067**	**0.045**	2.142	0.544
Libya	2.732	0.255	0.100	0.951
Morocco	**11.709**	**0.008**	1.469	0.689
Saudi Arabia	0.619	0.431	1.862	0.172
Tunisia	0.241	0.971	2.542	0.468
Yemen	**10.282**	**0.001**	0.033	0.857
Panel	**61.018**	**0.000**	**39.227**	**0.026**

5 .CONCLUSION AND RECOMMENDATIONS

Terrorism has remained serious country level and global problem despite the considerable improvements in combat with terrorism. The regions of the Sub-Saharan Africa, South Asia, and MENA are the top three regions which are most negatively affected by terrorism in the world, but the regions of Central America and the Caribbean, Russia and Eurasia, and South America are the lest affected regions by terrorism. Many factors such as institutional, economic, and social factors have been suggested as the determinants of terrorism. In this research, the reciprocal interaction between human development, major economic variables, and terrorism have been investigated in sample of selected MENA countries over the 2005-2019 period through causality analysis with heterogeneity and cross-sectional dependency given the related literature.

The panel causality analysis revealed a significant mutual interaction between human development and terrorism, a significant causality from real GDP per capita to the terrorism, a significant mutual interaction between unemployment/youth unemployment and terrorism, and a significant mutual interaction between inflation and terrorism in compatible with theoretical expectations. In this context, on one hand human development, better economic performance (higher real GDP per capita, lower

unemployment and youth unemployment and inflation) can significantly affect the terrorism, on the other hand terrorism can affect the human development and economies through damaging the infrastructure and investments and causing death and disability of people. Therefore, human capital and economic performance as well as institutional, legal and military are important in combat with terrorism.

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