Determinants of Terrorism in Tunisia: An Empirical Study

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Abstract	Keywords
The aim of this study is to analyze the determinants of terrorism in the Tunisian context. The determinants of terrorism include various socio-economic variables such as per capita GDP, unemployment, political stability, poverty, the informal sector and higher levels of education. To do so we used the ARDL modeling on annual data from 1979 to 2015. The results of the Bounds test confirmed the existence of at least one cointegration relation between our variables which proves the existence of a long-term relationship. The long-term results indicate a positive and significant relationship between terrorism and the informal sector, political stability as well as higher education and unemployment rates. The long-term relationship indicates that FDI, poverty and economic growth negatively affect terrorism. Similarly, short-term results confirm the existence of a relationship between socio-economic variables and terrorism.	Terrorism; Determinants; Socio-economic; ARDL; Tunisia.
الملخص	الكلمات المفتاحية
تهدف هذه الدراسة إلى تحليل محددات الإرهاب في السياق التونسي، وتشمل هذه المحددات متغيرات اجتماعية–اقتصادية مختلفة مثل نصيب الفرد من إجمالي الناتج المحلي والبطالة والاستقرار السياسي والفقر والقطاع غير الرسمي ومستويات التعليم الأعلى، وقد استخدمنا للقيام بذلك نموذج ARDL اعتمادا على البيانات السنوية من 1979 إلى 2015. حيث أكدت نتائج اختبار Bounds وجود علاقة ترابط واحدة على الأقل بين متغيراتنا والتي تثبت وجود علاقة طويلة الأمد. وتشير هذه النتائج طويلة الأجل إلى وجود علاقة إيجابية وهامة بين الإرهاب والقطاع غير الرسمي ، والاستقرار السياسي، فضلاً عن ارتفاع معدلات التعليم والبطالة. كما تشير العلاقة طويلة الأجل إلى أن الاستثمار الأجنبي المباشر والفقر والنمو الاقتصادي يؤثر سلبًا على الإرهاب، وبصفة مماثلة تؤكد النتائج قصيرة الأجل وجود علاقة بين المتغيرات الاجتماعية والاقتصادية والإرهاب.	الإرهاب؛ المحددات؛ الاجتماعي والاقتصادي؛ ARDL؛ تونس.

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1-Introduction

Much effort has been done by authorities for the global fight against terrorism not only to minimize the number of victims, but also to ensure economic and political interests. Political and socio-economic conditions such as: political instability, country size, poverty, social inequality, unemployment, inflation, low development rates and institutional factors at both international and internal levels are considered the main determinants for the emergence of terrorism.(Frey et al., 2007, Freytag et al.,2010 et Krieger and Meierrieks 2011).

Terrorism, as a phenomenon, marks the existence of a serious disturbance in the social and moral values in society. It has been defined by various authors and used by various government agencies and academic communities. However, for reasons of political and ideological conflicts, terrorists consider themselves warriors and jihadists in sacred war against infidels whereas those who fight against this phenomenon consider them as terrorists (Europol 2008, Jenkins 2003, Sick 1990, Silke 2004, William 2000). Thus, this phenomenon can be defined as: "... the use or threat of additional normal (traditional) violence by national subgroups to achieve a political, religious or ideological objective through threats to a broad public, which is not usually directly involved in decision-making"(Enders et Sandler 2002).

Terrorists generally target tourists, military and police bases, religious personalities, public institutions, diplomatic personnel, government officials, means of transport, airports. Terrorist attacks use various tactics such as suicide bombing, bombing, kidnapping, hostage-taking and armed attacks (Abadie, 2006), which cause casualties among humans and affect infrastructure causing a high economic loss (Ali, 2010).

The attacks of September 11, 2001 upset social, economic and geopolitical conditions globally (Michael, 2007). The boom of information and communication technologies have eased the task for terrorists through the use of national land level for recruitment, training, buying of criminal weapons and better planning to create terror worldwide (Shukla, 2009).During the post-revolution time, Tunisia was strongly affected by such dynamism where terrorist actions have become worrisome for the State, order and human rights organizations. This article attempts to analyze the determinants of terrorism in Tunisia. It aims at analyzing the links between terrorism and various social and economic variables and investigating their short-term and long-term effects on terrorism in Tunisia.

2. Literature review

The theoretical and empirical literature provides various determinants of the rise of terrorist incidents in developed and developing countries. Indeed, Gurr (1970) assumes that poverty, income inequality and political violence are the main determinants of terrorism. Tilly (1978) assumes that terrorism increases because of the increasing violence and fragility of the political structure. Developing Gurr's (1970) and Tilly's (1978) model, Muller and Seligson (1990) integrate income and land inequality. They have shown that higher land inequality tends to provoke

political violence resulting in an increase in terrorist activity. In an investigation of the sources of inequality', London, B. Robinson, T.D(1989) showed that investment by multinational companies in developing countries is the main source of income inequality through the creation of several employment opportunities for skilled workers. This distinction increases hatred against the moneyed classes and becomes the source of violent individual behavior which increases terrorism. Following the same views, Fearon et Laitin (2003) showed that terrorism is directly affected by poverty and political instability. Li and Schaub (2004) also reported that open trade, foreign direct investment and portfolio investments are determinants of rising terrorist attacks. Abadie (2006) assumes that unemployment is also one of the determinants of the rise in terrorist attacks. In the field of economic theory, several studies have been carried out and showed the existence of a direct and significant relationship between inflation and terrorism(Auvinen 1997, Caruso and Schneider 2011, Feldmann And Perala 2004, Nicole 2003, Piazza 2006 and Samaranayake 1999), which means that a high rate of inflation is likely to destabilize the economy and is responsible for social unrest.

Azam and Thelen (2008) have shown that the enrollment rate can be a catalyst in amplifying the number of terrorist attacks. As for the effect of level change of GDP on terrorism, Li and Schaub (2007) and Collier and Hoeffler (2004), have proved a negative and versatile link between the two variables of GDP: improving living standards reduces the likelihood of terrorism and vice versa.

In line with the theoretical studies, many empirical studies dealt with the determinants of terrorism. Freytag and al., (2010) used negative binomial modeling to test the hypothesis that poor socio-economic development is conducive to terrorism. The results of the studies on a sample of 110 countries between the years 1971 and 2007 showed that the socio-economic variables determine the phenomenon of terrorism. Thus the authors concluded that countries can benefit from economic development and growth by reducing terrorism. Subhayu B. and Javed Y. (2011) studied the relationship between political freedom and terrorism for a set of 125 developing countries. Using negative binomial regressions, they showed that political freedom has a significant and nonlinear effect on domestic terrorism, but has no statistical significant effect on transnational terrorism.

Husain (2003), sought to identify some causes of terrorism from a historical study of the Pakistani economy. The main findings of this study indicate that the Pakistani government must eradicate poverty and illiteracy to become a more moderate and modern Muslim country, which will help defeat terrorism.

In a study on the determinants of terrorism in Pakistan, Ismail and Amjad (2014) used time series data from 1972 to 2011. The authors introduced the terrorist incidents as a dependent variable and an explanatory variable vector that includes per capita GDP, political rights, literacy, inflation, unemployment, poverty and inequality. The results indicate that there are long-term relationships between the different economic and social variables. The results suggest that literacy, poverty, inflation and per capita GDP are the most important determinants of terrorism in

Pakistan. Political repression, unemployment and inequality have insignificant long-term relationship with terrorist incidents.

Carlos PB João RF and Luis A. Gil-Alana (2008) examined the behavior of American victims in Africa caused by terrorism for the period 1978 to 2002. Through a descriptive analysis of this period of time, the authors concluded that most terrorist incidents occurred in 1993. They also found that the ranking of countries according to income level shows that the highest proportion of attacks occurred in semi-arid countries with low income, providing evidence of a positive relationship between poverty and terrorism at an aggregate level. These findings are confirmed by the results obtained through the use of long memory regression models. In fact, a negative relationship between the standard of living in countries affected by terrorism and the number of American victims is detected, which implies a positive relationship between terrorism and poverty.

Roberto E. and David P. (2016) analyzed the relationship between interregional inequality and the incidence of domestic terrorism in a panel of 48 countries over the period 1990-2010 using the negative binomial estimator. The results of the study show that a high level of interregional inequality increases the number of domestic terrorist events.

3. Terrorism in Tunisia

Terrorist attacks cause great suffering and sometimes enormous material damage. Apart from human damages and infrastructure deterioration, they increase the departure of foreign investors, create a climate of uncertainty and cause disturbances in the allocation of internal resources as well as the indirect costs caused by implementing security measures nationwide. However, these considerable economic problems are mere material consequences of terrorism. The human consequences are worse. Today, terrorism has become a global phenomenon constantly affecting both developed and developing countries. Indeed, between 2011 and 2013 the number of terrorist attacks has more than doubled, from 5,000 to 11,823, according to a study by the American financial rating agency Moody's (2.4 attacks per million people in 2013 against 0.7 in 2011).On average, the immediate impact of a terrorist attack on a country's growth is between 0.5% and 0.8%, according to Moody's. The Tunisian economy is facing a threat of terrorism that could affect economy through various channels and it has different objectives and motivations, using the most advanced weapons, occupying wider areas, damaging the infrastructure and targeting a wider public (civilians, army personnel, foreigners, etc.).The scope of terrorism in Tunisia has attracted great attention both locally and globally.

Since the independence, the Tunisian economy has been shaken by a wave of terrorist attacks that has reached its peak in recent years. Indeed, in the post-revolution period Tunisia was affected by nearly 73 terrorist attacks, affecting tourists, the military, politicians and civilians.

Graph 1: number of attacks
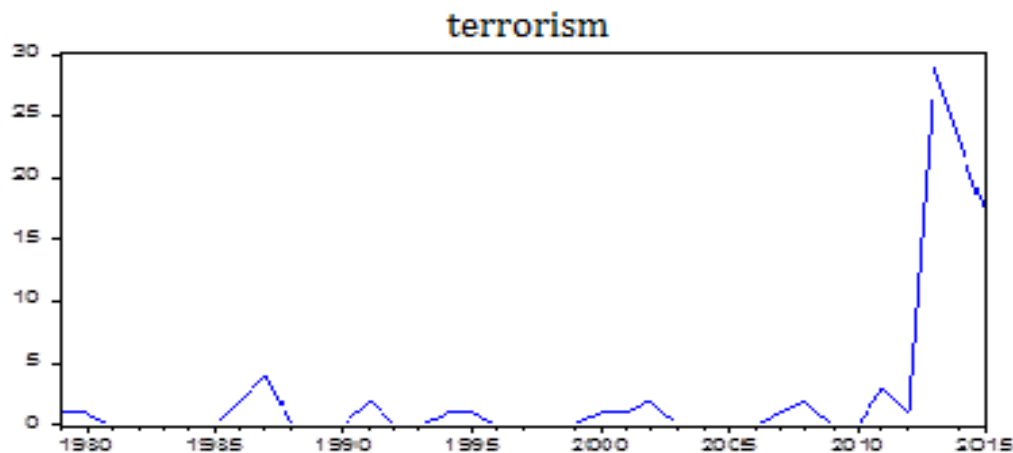
Terrorists regularly target tourists. Attacks on touristic sites are relatively easy to organize and have extensive international media coverage since their victims come from many countries and can seriously jeopardize the economy of the targeted country. Only a month after the Bardo attack, which occurred on June 26th 2015 and killed 39 foreign tourists, reservations fell by 17% compared to 76% in July 2015. It took only a few days for tourist bookings to dry up. Flights from the United Kingdom and Ireland to Tunisia decreased by 11% due to the spontaneous curiosity of British and Irish travelers and the high level of attention brought on by the media about this tragic event. A few days later, flights fell by 16%. Other than casualties among tourists, terrorist attacks have affected the armed forces. Indeed, in September 2015 a suicide bomber detonated a vest filled with explosives on a bus carrying Tunisian presidential guards in the area of Avenue Mohamed V, Tunis City. This attack took the lives of 12 victims among the presidential guard while17 others were wounded. In June 2015 an assailant attacked a military barracks in the city of Tunis. This attack killed several soldiers. The assailant and ten others were wounded in the attack. In May 2014, one assailant opened fire on a bus carrying soldiers in the town of Nebeur, Kef governorate, in Tunisia causing the death of five soldiers and wounding 10 others in the attack. In July 2013 armed men ambushed a Tunisian army patrol on Chaambi Mountain, near the town of Kasserine where at least eight soldiers were killed and four others were wounded.

The effects of terrorism have even spread to Tunisian political figures. Indeed, in February 2013, ChokriBelaïd, the general secretary of the Patriotic Democrats party and the coordinator of the Popular Front Coalition was shot in front of his private residence in the city of Tunis. Five months later, two armed people opened fire on the vehicle of the eminent politician of the Popular Party and Member of Parliament Mohamed Brahmi.

Terrorists have not only targeted the military and political figures, but civilians as well. In November 2015, a shepherd was decapitated by armed attackers in the

Jebel Mghila region, Jelma district, SidiBouzid, Tunisia. The terrorists responsible for the incident said that the victim was killed because he was a military informant. Since the fight against terrorism requires a strengthening of the security apparatus, in particular by the Ministry of the Interior and the Ministry of Defense, the burden increased on the Tunisian government. Consequently, the budget of these two ministries rose from 11% to 14.5% respectively in 2014 and 2015, against a reduction rate of 72% in the Ministry of Employment budget in 2015 compared to the 2014 budget. This fiscal contraction follows other budget revisions in 2014, namely, the Ministry of Development and the Ministry of Agriculture by 3.3% and 10% respectively. As a result, the financial increase cost in the budgets of the two ministries, defense and interior, represents 0.67% of GDP.

FDI is both a source of financing for the current account and contributes to technological transfer and employment. However, foreign investors tend to be very sensitive to the risk of instability and insecurity in their host countries. Thus, a possible attack not only discourages foreign investors to settle in Tunisia but also pushes those who are already there to relocate: a phenomenon called "scissors effect". The economic and social situation of Tunisia has not escaped this effect. Since 2010, more and more foreign companies are relocating from Tunisia resulting in job losses of about 12 jobs per project created. An attack causes an average of 300 companies to relocate, representing about 0.04% of GDP. FDI in industrial and service sectors declined in terms of number of projects created. Investment and employment rates rose to 2.87%, 7.57% and 3.07% respectively in the first 7 months of 2015 compared to the same period of 2014 (APII).

In short, terrorism negatively affects development and imposes significant economic damage on the economy. Thus, fighting terrorism can generate significant benefits for the economy by improving trade flows and reducing the delocalization of investments that undermine economic growth in the long-term. Therefore, Tunisia must make efforts to improve the productive potential of the economy. National security improvement will be the key factor for future development in economic activities.

4. Methodology:

4.1. Data

The empirical study is based on annual data of the period 1979 to 2015. The Terrorism Index (TI) is available in the Global Terrorism database (GTD), which measures the number of annual attacks. The per capita income (GDP / P) is accessible from the World Development Index (WDI) database and it is used as a proxy of economic growth. The Political Instability Index (POLITY) is accessed from the Center of Systemic Peace (INCSCR) database, which captures the spectrum of the political regime on a 21-point scale ranging from -10 (Hereditary monarchy) to +10 (consolidated democracy). The unemployment rate (UMPL) is extracted from the database of the World Bank and the Tunisian National Institute of Statistics. The human poverty index (HPI) is accessible from the World Development Index (WDI) database. As for the missing values, they are calculated

by the authors through linear interpolation. Foreign direct investment (FDI) and gross enrollment ratio (GER) are extracted from the World Bank (WDI) database. Finally, the informal sector (INFOR) is extracted from the database used by Ceyhun Elgin, OğuzÖztunalı in their paper (Shadow Economies around the World: Model Based Estimates) and Mehdi Abid2016[1].

4.2. Econometric method

The determinants of terrorism are analyzed using the co-integration method. Different tests allow for the testing of the existence or lack of a relation of integration between the variables of an econometric model. However, the Co-Integration by Delay or Auto Regressive distributed Lags (ARDL) approach of co-integration proposed by Pesaran et al (1999, 2001) is increasingly used in research. This choice is justified by the fact that this technique has the advantage of being more efficient for studies with a small sample and is applicable to the series to be integrated in order 1, level 0 or mutually integrated, in contrast to traditional integration tests such as those of Engle Granger (1987), the Johansen test (1988) and the Johansen and Juselius' test (1990).However, the technique ceases to be applicable when the order of integration of the series is greater than 1. Another advantage of this method is that it makes it possible to estimate the dynamics of long and short term in the same econometric model (Akpan et al, 2012). Our ARDL specification of the relationship between terrorism and socioeconomic variables is represented by equation (1):

$$
\begin{aligned}
\Delta(TI)_t = {} & \alpha_{01} + \alpha_{11}(TI)_{t-1} + \alpha_{21}\ln(GDP)_{t-1} + \alpha_{31}(\text{POLITY})_{t-1} + \alpha_{41}(UMP)_{t-1} + \alpha_{51}(POV)_{t-1} + \alpha_{61}(IDE)_{t-1} + \alpha_{71}(INFOR)_{t-1} \\
& + \sum_{k=1}^{n}\beta_1\Delta(TER)_{t-k} + \sum_{k=1}^{n}\beta_2\Delta\ln(GDP)_{t-k} + \sum_{k=1}^{n}\beta_3(\text{POLITY})_{t-k} + \sum_{k=1}^{n}\beta_4\Delta(UMPL)_{t-k} + \sum_{k=1}^{n}\beta_5\Delta(POV)_{t-k} \\
& + \sum_{k=1}^{n}\beta_6\Delta(IDE)_{t-k} + \sum_{k=1}^{n}\beta_7\Delta(INFOR)_{t-k} + \varepsilon_{1t} \qquad\qquad (1)
\end{aligned}
$$

However, using the dependent variable in equation (1), at its long-term equilibrium level may not be immediate due to a possible change in one of its determinants. Thus the speed of adjustment between the short and the long term levels of the dependent variables can be captured by estimating the following error correction model:

$$
\begin{aligned}
\Delta(TI)_t = {} & \alpha_{01} + \sum_{k=1}^{n}\beta_1\Delta(TER)_{t-k} + \sum_{k=1}^{n}\beta_2\Delta\ln(GDP)_{t-k} + \sum_{k=1}^{n}\beta_3(\text{POLITY})_{t-k} + \sum_{k=1}^{n}\beta_4\Delta(UMPL)_{t-k} + \sum_{k=1}^{n}\beta_5\Delta(POV)_{t-k} + \sum_{k=1}^{n}\beta_6\Delta(IDE)_{t-k} \\
& + \sum_{k=1}^{n}\beta_7\Delta(INFOR)_{t-k} + \beta_8\,\varphi_{t-1} + \varepsilon_{1t} \qquad\qquad (2)
\end{aligned}
$$

Where Δ represents the first difference operator and error correction term (ECT) of our model. The (ECT) in the equation measures the rate of adjustment of imbalance between the short and the long term of the dependent variable. We expect that the (ECT) will have a negative and significant value (Gujarati DN 2003).

To verify the existence of a cointegration relation, the first step consists in establishing the order of integration of each variable. To perform this task we will use the Dickey Fuller (ADF) test and the Phillips-Perron (PP) tests which are popular unit root tests used to verify the order of integration of the series. These

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tests are carried out with different specifications to check if the series is stationary at level or in difference. These tests have a null hypothesis of non-stationary against a stationary alternative. In the second step, we have to verify the existence of a co integration relation; we will use the co integration test of Bounds. This test is essentially based on the statistical F of Wald where null hypothesis is the absence of a relation of Co integration. The Bounds test consists of a first step estimated model (1) by the least ordinary square (LOS). We then test the joint nullity of the long-term multipliers using the F-test. So, we consider the following two hypotheses:

H0 : $\alpha_{11} = \alpha_{21} = \alpha_{31} = \alpha_{41} = \alpha_{51} = \alpha_{61} = \alpha_{71} = 0$ against the alternative hypothesis H1 : $\alpha_{11} \neq \alpha_{21} \neq \alpha_{31} \neq \alpha_{41} \neq \alpha_{51} \neq \alpha_{61} \neq \alpha_{71} \neq 0$.

Finally, the third step consists in comparing the calculated statistical F with the critical value. Indeed, Pesaran et al.(2001) report two sets of critical values for a given level of significance. The first level is computed by assuming that all the variables included in the ARDL model are integrated in order zero I (0), while the second is calculated assuming that the variables are integrated of order I (1).If the calculated F statistics are above the upper critical limits, the non-Co-integration is rejected, indicating the existence of a Co-integration relation. If the calculated F statistics are lower than the lower critical value, we cannot reject the null hypothesis of non-co-integration. Finally, if the calculated test statistics lie between the terminals, a conclusive inference cannot be made without knowing the order of integration of the underlying repressors. Once estimated, co-integration equations are used to calculate long-run elasticity. If the Co integration relation is not detected, the short-term causality relation is measured. After specifying our modeling, the general approach will be pursued by a number of specification tests, namely: (i) residual normality (Jarque-Bera normality test); (ii) Series correlation (Breusch-Godfrey LM test); (iii) Heteroskedasticity (ARCH test); And (iv) model specification (specification of the Ramsey-RESET test regression error).These steps are followed by the CUSUM and CUSUM square test to analyze the stability of the model. The results are presented and discussed in the next section.

5. Results and discussions

Before analyzing these variables using the ARDL approach proposed by Pesaran et al 2001, the stationarity of all variables was tested, first using ADF (Augmented Dickey-Fuller) and PP (Phillips - Perron) and then the structural rupture test. The results presented in Table 1 show that all variables are integrated of order 1 I (1) with the exception of the variable unemployment which is stationary in level I (0). These results confirm that all variables have an order of integration of less than 2.

Table 1: stationarity test

| Variables	ADF Test		PP Test		Breakpoint Test	
	In level	First difference	in level	First difference	in level	First difference
TI	-1.99[0]	-7.21[0]***	-1.998[0]	-7.76[5]***	-24.84(2012)***	-8.54(2012)***
CHOM	-3.35[0]**	-7.32[0]***	-3.293[4]**	-7.430[3]***	-	-7.485(1998)***

					5.5852(2005)***	
POLITY	0.114[0]	-5.541[0]***	0.081[1]	-5.542[1]***	-9.217(2010)***	-7.820(2010)***
INFOR	-0.472[1]	-3.936[0]***	0.082[3]	-3.969[2]***	-2.886(2010)	-5.291(2007)***
SCOSUP	-0.608[1]	-8.363[0]***	-0.068[4]	-8.787[4]***	-3.343(1999)	-9.15 (2005)***
HPI	-0.113[1]	-4.153[0]***	0.542[0]	-4.171[2]***	-3.202(1995)	-4.453(1998)**
ln(GDP)	-0.040[0]	-5.795[0]***	-0.040[2]	-5.798[2]***	-2.433(1995)	-6.106(2007)***
IDE	-2.644[0]	-5.509[1]***	-2.644[0]	-9.08[10]***	-4.136(2005)	-7.728(2011)***

SC is used to choose the number of optimal delays for the ADF tests, whereas « Bandwidth » is used for PP tests. The critical values related to ADF and PP tests were provided by MacKinnon (1996). The bracketed figures represent the delay levels based on the information criterion of Schwarz. Figures between square brackets represent Newey-West bandwidth's automatic selection using the Bartlett kernel. Note that only the constant is included in tests. (***), (**) and (*) denote statistical significance at the 1%, 5% and 10% levels respectively

To avoid any ambiguity in the order of integration of the variables, we will use the structural rupture test. Indeed, the evolution of the variables in the time presented in graph 2 shows the existence of the peaks; this led us to wonder about the existence of a change in regime. The results of the structural breaks test presented in Table 1 show that the variables terrorism (TI), unemployment (UMPL) and the variable (POLITY) are stationary while the other variables are stationary in the first difference.

Graph 2:
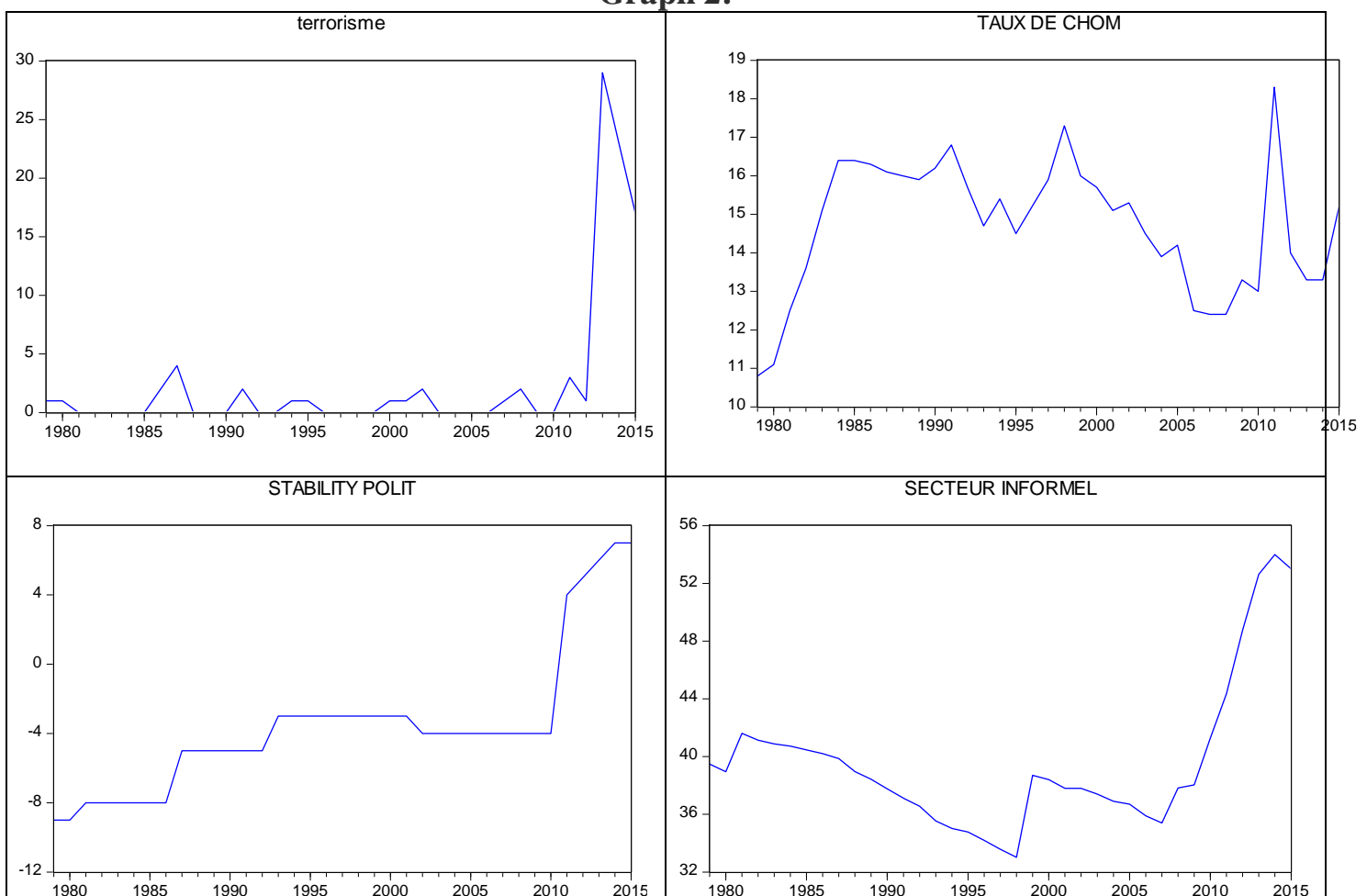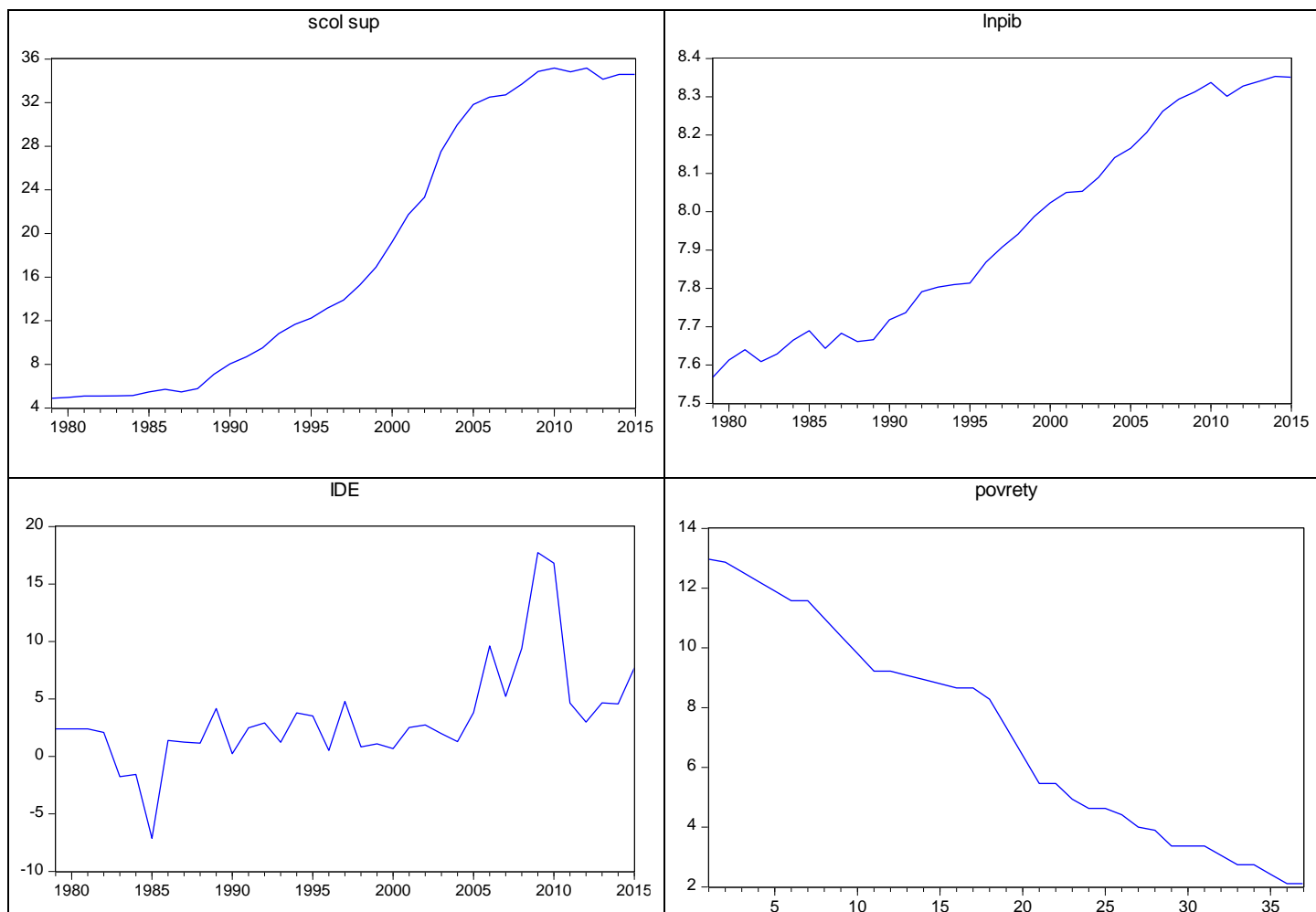
The results of the stationarity tests led us to study the relationship between terrorism and socio-economic variables by applying the co integration tests related to the ARDL approach. The Bounds test requires the selection of the appropriate degree of delay (Feridun and Shahbaz 2010). In our case, the AIC selection criterion is used. Table 2 shows the results of Bounds integration test.

Table2: Boundsintegration test

Dependent variable	lagselection	F-statistic	Decision
TER	(3, 2, 3, 2, 2, 3, 3, 3)	20.22144	cointegration
Significance	I0 Bound	I1 Bound	
10%	2.03	3.13	
5%	2.32	3.5	
2.5%	2.6	3.84	
1%	2.96	4.26	

Lower and Upper-bound critical values are taken from Pesaran& al. (2001), Table CI(i) Case I.

The results show that the calculated statistical F is of 20.22144 which is higher than the critical value reported by Pesaran et al (2001) at 1% threshold. This

confirms the existence of at least one long-term relationship between the variables in Tunisia for the period from 1979 to 2015.

The existence of a long-term relationship leads to estimate equation (1) using the ARDL technique. The results of the estimation are presented in Table 3:

Table 3: long-term relation

variable	Dependent variable EC		
	Coefficient	T-Ratio	Prob.
UNEMPLOYMENT-RATE	0.243082	2.641396	0.0459
POLITICAL-STABILITY	1.022552	12.626763	0.0001
INFORMEL-SECTOR	0.266789	3.813159	0.0125
IDE	-0.219869	-5.001118	0.0041
SCOL_SUP	0.453075	5.097470	0.0038
POVRETY	-0.063130	-0.188551	0.8579
LNGNP	-22.844860	-3.419515	0.0188
C	-5.181280	-2.544982	0.0315

The long-term results show that the unemployment rate is significantly negative at the 5% threshold. An increase in the unemployment rate of 1% increases the number of terrorist attacks by 0.24%. Thus, an increase in the unemployment rate facilitates the attraction of young unemployed graduated by terrorist groups. This result is consistent with the work of Berman et al (2009) and Honaker (2010) but contradicts the studies of Oyefusi (2010). Moreover, the results show that economic growth affects adversely the phenomenon of terrorism. Thus, any increase in GDP of 1% results in a 22.84% decrease in the number of terrorist attacks. This result is consistent with the study by Nasir et al (2011), and contradicts the results of Shahbaz M. (2013). The legitimacy of this result stems from the fact that a country with strong economic growth can fight the phenomenon of terrorism using measures that guarantee more security and prevention. The results of the long-term relationship prove the existence of a significantly positive effect of political instability on terrorism. An increase of 1% in the level of political instability increases the number of attacks by 1.02%. This result is in line with the work of Dreher and Fischer (2010) and Aisha Ismail &ShehlaAmjad (2014). Thus, politically unstable countries offer favorable conditions for the spread of terrorism. It was noted that terrorist groups carry out human resources policies that favor the most highly educated and economically well off people (Krueger and Maleckova, 2003).A related aspect that has received less attention is that the human capital required for terrorist attacks is specific and involves a complex combination of skills that are expensive to acquire and maintain. The skills of terrorists have a high rate of obsolescence and are not easily transferable from one profession to another. In addition, some forms of domestic political instability (guerrilla warfare and civil war) lead to a sharpening of the military, tactical and organizational skills necessary to carry out terrorist acts,

while other forms (such as riots, protests against the current government and strikes) do not lead tothe same level or the same kind of skills.

These findings explain the positive and significant effect of the higher enrollment rate on the phenomenon of terrorism. Similarly, the results show that the coefficient associated with the informal sector is positive and significant at the 5% threshold. Any increase in the informal sector level of 1% leads to an increase in the number of terrorist attacks by 0.26%. The informal economy is one of the main sources of funding for terrorist groups. Thus for Tunisia, the security vacuum that followed the 2010-2011 uprising against the regime of Ben Ali, as well as the chaos caused by the war in Libya largely explain the worrying increase of smuggling and the informal economy. Informal and parallel trades are the economic engine of the entire region. While these had long been the only source of income, the introduction of hazardous and cost-effective products (narcotics and firearms) on the national territory was a cause of concern. Synthetic drugs and quantities of firearms enter regularly from Libyan territory. Similarly, the northern half of the Tunisian-Algerian border tends to become the most used area for the circulation of cannabis resin and arms. Finally, the results show the existence of a negative and significant relationship between FDI and the rise of the phenomenon of terrorism.

1% increase in FDI leads to a 0.21% reduction in the number of terrorist attacks. Thus an increase in FDI is likely to increase not only economic growth but also the power of the government to fight this phenomenon and create more jobs

After identifying the long-term relationship between the variables, the error correction model must be estimated. The ECM estimations are presented in Table4:

Table4: short term relation

Dependent variable: TER			
Lag structure: (3, 2, 3, 2, 2, 3, 3, 3)			
Variable	Coefficient	t-Statistic	Prob.
D(TERRORISM(-1))	1.905366	5.567721	0.0026
D(TERRORISM(-2))	1.261822	4.702120	0.0053
D(UNEPLOYMENT-RATE)	1.572545	2.754683	0.0401
D(UNEPLOYMENT-RATE(-1))	0.832902	3.026432	0.0292
D(POLIT-STABILITY)	0.776482	3.704569	0.0139
D(POLIT -STABILITY(-1))	0.993276	1.735750	0.1431
D(POLIT -STABILITY(-2))	-2.426171	-3.662702	0.0146
D(INFORMAL-SECTOR)	1.662036	5.687468	0.0023
D(INFORMAL-SECTOR(-1))	-0.876310	-4.116815	0.0092
D(IDE)	0.185214	2.852882	0.0357
D(IDE(-1))	1.153016	4.516663	0.0063
D(SCOL_SUP)	2.337003	3.278280	0.0220
D(SCOL_SUP(-1))	-0.380127	-0.748645	0.4878

|			
D(SCOL_SUP(-2))	-2.574306	-2.424323	0.0598
D(POVRETY)	-6.308553	-2.452829	0.0577
D(POVRETY(-1))	3.396624	2.446102	0.0582
D(POVRETY(-2))	-1.662553	-1.442765	0.2087
D(LNGNP)	-40.162420	-2.470161	0.0565
D(LNGNP(-1))	68.717946	3.209411	0.0237
D(LNGNP(-2))	-5.879115	-0.696106	0.5174
CointEq(-1)	-3.868395	-7.585679	0.0006

Adj. R2=.0.996493
AIC=2.420
F-stat.=106.5506, F-prob.=0.000

The results presented in Table (4) show that the term ECT associated with our model (2) is statistically significant and negative, confirming the jump test on the existence of at least one relationship between the model variables in the long term. The ECT value shown in Table (4) is in the order of ECT = -3.868395 which implies that the number of terrorist attacks converges to long-term equilibrium by a rate of 38.68% across economic growth, unemployment, the informal sector, political instability, foreign direct investment, enrollment and poverty rate. As for the short-term coefficients, we note that the delays of the variable terrorism have a highly significant and positive effect. Once the phenomenon of terrorism has appeared in a certain place, the speed of its propagation goes faster over time. The results show also that the coefficient associated with the delayed unemployment rate of a period is higher than the rate associated with the same delayed variable of two periods. The increase in the phenomenon of unemployment is becoming one of the main catalysts for the phenomenon of terrorism. As for the high level of educated people we notice that it affects terrorism negatively. Finally, our results indicate that poverty has a positive and significant effect in the short term.

Table 5: diagnostic test

	LM Version	F Version
χ2 (serial correlation)[1]	.91514[.339]	.71011[.407]
χ2 (functionalform)[2]	.0063429[.937]	.0048009[.945]
χ2 (normality)[3]	.34375[.842]	
χ2 (heteroskedasticity)[4]	.0020448[.964]	.0019343[.965]
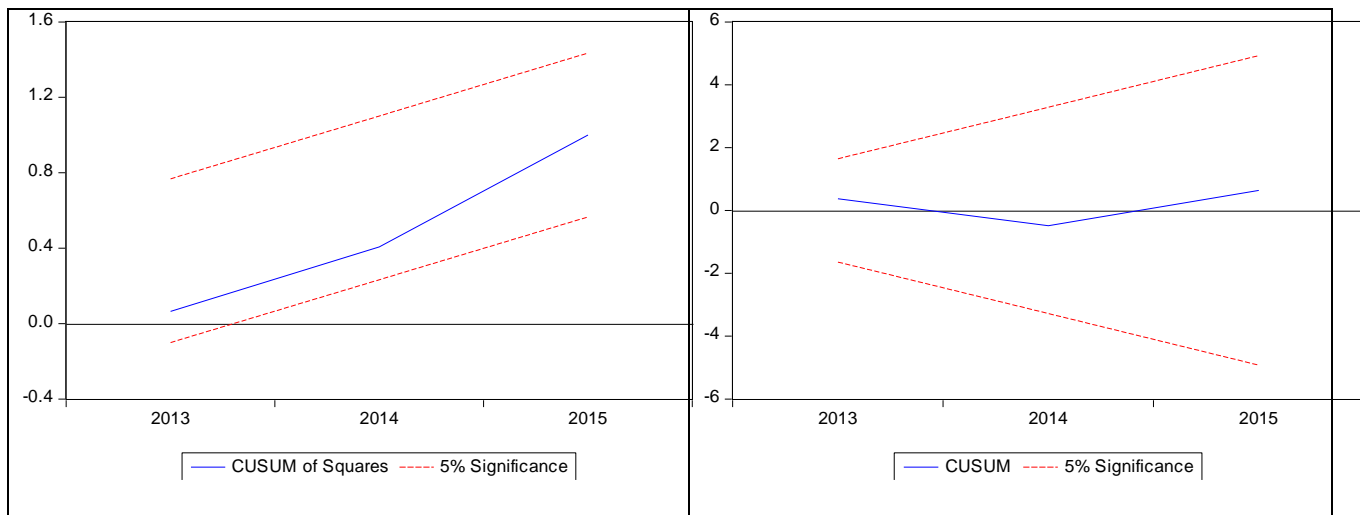
 1 TheBreusch–Godfrey LM test statistic for no serial correlation.

  2 The White′s test statistic for homoscedasticity.

  3 The Jarque–Bera statistic for normality.

 4 The Ramsey′s Reset test statistic for regression specification error.

Table 5 contains the results of the diagnostic tests of the selected ARDL model (3, 1, 3, 3, 3, 2, and 3). The normality JB test indicates that residues are normally distributed. Furthermore, on the basis of the Breusch-Godfrey test of serial correlation and the Breusch-Pagan-Godfrey test of heteroskedasticity, F -statistics indicate that we cannot reject the null hypothesis of absence of correlation of the series and also the absence of heteroskedasticity of the residues. After analyzing the diagnostic tests, a single econometric requirement for an ARDL model is the specification and verification of the presence of stability of parameters. In order to test the stability of the short-term and long-term coefficients estimated by the ARDL model, we perform the cumulative sum (CUSUM) and cumulative square (CUSUM Square) tests applied to recursive residuals from the ARDL model estimated in this paper (Brown et al., 1975).

In the results of the tests shown in Table 5, we note that the CUSUM and CUSUM squares parcels are within the 5% critical limits. Thus, we have empirical evidence that the estimated coefficients of the co integration model ARDL (3, 2, 3, 2, 2, 3, 3, 3) are stable.

6. Conclusions and political implications

The phenomenon of terrorism can be explained based on various factors, mainly unemployment, the informal sector, political instability, poverty, the level of GDP per capita, foreign direct investment, higher education, etc. During the period in question, the social and economic conditions of Tunisia were not satisfactory. The analysis of Co integration Bounds reveals a long-term relationship between the different social and economic variables and terrorism. The results of the long-term relationship have shown that unemployment rate, political instability, the informal sector and the rate of enrollment in higher educationpositively and significantly affect the phenomenon of terrorism. Nevertheless, the level of GDP per capita and foreign direct investment have negative and significant effects on terrorism. As for

poverty, we note the absence of any long-term effects on terrorism; this can be explained by the low levels of inequality in the Tunisian economy.

Similarly, important results have been obtained from the short-term relationship. These results showed that, contrary to the long-term result, the delayed poverty of two periods affects positively the phenomenon of terrorism. Similarly, important results have been obtained from the short-term relationship. These results showed that, in opposition to the long-term result, the delayed poverty of two periods positively affects the phenomenon of terrorism. Similarly, the history of terrorism is an important determinant of the spread of terrorism. We also found that in the short term the coefficient associated with unemployment is becoming increasingly important. Different econometric tests were applied to verify the reliability of the estimated model. The results were satisfactory and showed the absence of a problem of poor specification, heteroskedasticity, multi collinearity and autocorrelation in the model. The results also show that the residues are normal.

The results show also that socio-economic conditions constitute the real determinants for the amplification of terrorism. To combat this scourge , there needs to be social stability , political stability, freedom of expression, good governance and justice. So the first step in launching a policy to reduce terrorism is to improve the social and economic conditions. Political instability seems to be the main determinant of terrorism. As for the relationship between terrorism and per capita GDP, a greater effort to stimulate economic growth could be an important political measure to discourage terrorism in Tunisia.
Efforts to improve the quality of schooling by offering greater educational opportunities through the improvement of the educational system could be a good political measure.

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