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**AN ANALYSIS ON HOW TERRORIST ACTIVITIES AFFECT
ECONOMIC STABILTY**

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Key words: terrorism, game theory, network analysis, terrorist organizations, natural resources, economic dependency, socio-economic determinants

Summary:

Terrorism represents an issue at international level. Whether to a greater or lower extent, directly or indirectly, this phenomenon affects the vast majority of states around the globe. The consequences of terrorist events are economic, social and political, which makes the topic of extreme interest and with high research potential.

One aspect that suggests the complexity of this phenomenon is the fact that terrorism does not have a uniquely accepted definition. The difficulty arises not only from its complexity but also from a wide divergence of positions held by individuals, organizations, or states involved in counter-terrorism efforts.

Two examples of such definitions are: “premeditated and politically motivated violence perpetrated against non-combatant targets by subnational groups or clandestine agents, intended to influence an audience,” or “Terrorism is the unlawful use of force and violence against persons or property to intimidate or coerce a government, civilian population, or any segment thereof in furtherance of political or social objectives.”

Throughout his career Alex Schmid has conducted several studies on terrorism with the goal of centralizing the multiple perspectives found in the literature, with particular emphasis on how it is defined. He is especially known for his work in defining terrorism, starting with his first book published in 1984 and continuing with its updates until recently. By analyzing the content of 109 definitions of terrorism he found the following frequencies of various concepts used: violence and force (present in 83.5% of definitions), political motivations (65%), emphasis on terror and fear (51%), threat (47%), psychological effects and anticipated reactions (41.5%), discrepancy between objectives and victims (37.5%), intentional, planned, organized, and systematic actions (32%), method of combat, strategy, and tactics (30.5%).

While studies related to terrorism have been conducted since the 1980s, the topic became much more intensely studied after the September 11, 2001 attacks. The field has attracted researchers from various disciplines, with psychologists becoming the most prolific researchers between 2002 and 2011, even surpassing those in political and social sciences. This shift reflects the need for a comprehensive understanding of the phenomenon of terrorism across multiple dimensions: economic, psychological, social, and political.

Although significant progress has been made in understanding terrorism, ongoing research is essential in addressing existing gaps and in finding answers where research is still contradictory.

This paper is focused on developing models for detecting and combating terrorist activity. Although statistical models and numerical simulations can provide valuable insights into the causes or effects of terrorism, given the spontaneous and unpredictable nature of such attacks, they cannot be anticipated solely through the use of such models. For this reason, game theory-based models have been predominantly used.

Game theory is a relatively new discipline but with high potential in providing solutions for a wide range of situations in both economic life and everyday life. Like other sciences, game theory consists of a collection of models. A model is an abstract form used to understand observations and experiences.

In the scientific literature there are numerous areas of study concerning terrorism, and some of these have been explored in this work. Given the large number of definitions provided for terrorism, the study starts with a review of the main definitions used in the literature, as well as with an attempt to identify the most relevant authors and publications in this field. The paper further details several articles that present the advantages of using game theory as a useful tool for analyzing terrorism, as well as conflicts in general, including theoretical examples of games and specific applications. Another important aspect in the scientific literature is the study of terrorist networks as network games, with focus on the concept of social networks. Another significant topic is represented by the measures a state can take in order to combat terrorism. In choosing between reactive and proactive counter-terrorism measures it is necessary that the effects can be quantifiable so that optimal legislative measures can be adopted. The literature review section also presents a series of studies referring to conflicts and their macroeconomic consequences. Lastly, considering that cyberterrorism has emerged as a distinct branch of terrorism in recent years, a summary of attempts to define it has been provided. A review of its main characteristics, which either resemble or distinguish it from traditional terrorism and ordinary hacking, is presented, which may result in possible methods for combating it.

The next chapter details several specific concepts of game theory used to conduct case studies. In general, game theory provides solutions for conflict situations by modeling the interaction between agents and their decisions. Game theory offers a common language for formulating, structuring, analyzing, and ultimately understanding various strategic scenarios. A game, in game theory, is defined by a finite number of players interacting according to a set of rules, and the outcome for a player depends not only on its own decisions but also on the strategies played by other players. The elements of a game are defined, and then several types of games are detailed. Models of games in complete information, both static and dynamic, variations with incomplete information, and some notions related to cooperative

games are presented. For each type of game, the elements of the game, specific methods for determining equilibrium and some applications are mentioned.

Chapter 3 focuses on how terrorist cells and large terrorist organizations operate and interact, both in terms of their internal interactions and their interactions with state actors. As a starting point, a brief review of how terrorist activity has evolved over the years was conducted, from the activities of the Irish Republican Army and its transformations over time, to the networks that continue to cause significant human and material damage today. Significant terrorist attacks that occurred after 1990 were reviewed, attacks that not only remain in public memory but also resulted in significant changes in international cooperation and regulations concerning terrorism.

For empirical analyses, terrorist networks are approached as social networks, and the concept of centrality is used to identify actors with increased importance within the analyzed networks. The concept of centrality in a network is important for understanding the hierarchy, stratification, and inequalities within it. The better the structure of a network is known, the easier it is to identify key players within it, which can facilitate its destabilization. To dismantle a network, it is not necessary to annihilate all its members; therefore, if state actors can identify which players are more important in a terrorist organization, they can allocate their limited resources more effectively.

Also from the perspective of interactions within terrorist networks, using game theory, the behavior of two factions within the same larger terrorist organization is analyzed. Each faction's actions influence the well-being of the other while competing to rise higher in rank within the organization. The proposed analysis initially considers only the factions' decisions and gains as if there was no opposition from the state, with any attacks launched automatically being successful. Later, the state is introduced as a player, which, through military spending, can lead to different outcomes if a terrorist faction launches an attack. The proposed models were validated using data collected from two major terrorist attacks, the 2005 London bombings and the 2004 Madrid bombings.

Chapter 4 presents another perspective of terrorism, namely the potential that the dependence on natural resources has for leading to terrorism. When certain countries hold supremacy in certain markets, they can exert significant influence over resource-importing countries. This context allows them to use natural resource supplies as an economic and political tool to influence negotiations and impose economic sanctions on countries that do not meet their requirements. The case study used was Russia's dominance in the European natural gas market, which is heavily dependent on imports from Russia. In the context of the conflictual relation between Russia and Ukraine, a significant part of the natural gas transport network is uncertain. For this reason, the proposed study attempts to analyze how the natural gas transport infrastructure can be adapted in the event of reductions or interruptions in gas supply, as well as how the bargaining power of market players is affected in each proposed scenario.

From another point of view, the specific for transporting energy resources is also susceptible to being affected by terrorist attacks. The consequences of such attacks can extend beyond the actual location of the attack. For example, as in the case of natural gas transport systems, which are part of a larger network including electricity and communication infrastructure, an attack on one element can cause cascading effects on others, amplifying the overall impact of the attack. A concrete example of such an impact was the Nord Stream pipeline explosions in 2022, which, although not confirmed as terrorist acts, generated a significant impact on the European natural gas market, right on the brink of winter.

Given the complexity of terrorism worldwide, the final chapter focuses on how terrorism correlates with a state's economic condition and the economic and social factors determining it. The topic is approached both from the perspective of economic factors that may favor the emergence of terrorism and from the macroeconomic consequences when it occurs.

Using a regression on panel data, the macroeconomic consequences of terrorism are estimated on several groups of states, groups formed based on the similarity of some macroeconomic characteristics. The hypothesis that was tested referred to terrorist incidents having higher recurrence in developed countries, even though the negative impact on economic growth is more prominent in developing countries.

In the next stage, a series of socio-economic factors that may facilitate the emergence of terrorism were tested, with applicability that if confirmed, these could be used in predictive models for terrorism. A series of economic variables, as well as other non-economic control variables such as democracy, regime stability, government size, population size, religion, and military spending, were used. The results showed that terrorism is more frequent in countries where the opportunity cost of terrorism is lower. Using the same variables, the relationship between the studied economic and social determinants and the likelihood of certain types of terrorism occurring was verified. It was considered the classification of types of terrorism based on the motivation behind terrorist attacks, which includes: jihadist terrorism, ethno-nationalist and separatist terrorism, left-wing and anarchist terrorism, and right-wing terrorism. Additionally, corruption was studied as an influencing factor for terrorism. Applying a game theory model to the specific case of corruption in Romania's healthcare system, conditions under which patients are willing to perpetuate or incriminate the phenomenon of corruption, as well as in which situations doctors participate in this phenomenon or not were determined.

Through the proposed models and case studies, attempts were made to validate several hypotheses stated in the literature and to identify directions where research may be further developed and improved.

To articulate recommendations aimed at improving counter-terrorism prevention and intervention methods, a deep understanding of the subject and its indirectly related aspects is necessary. Statistical

and econometric models show the influencing factors in the formation and development of terrorist organizations, as well as the nature of these factors (political, economic, social). By addressing these factors, actions can be taken that, although indirectly, affect the potential for terrorism.

Models based on game theory allow states to predict the actions of terrorist organizations and thus intervene in the most efficient way with minimal costs. Countries can form coalitions to combat acts of terrorism, thus benefiting from a much broader information collection network. In this way, much more accurate calculations regarding the structure of potential networks or their gains in the event of attacks can be made, allowing more targeted actions against terrorist organizations.