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# Terrorist Events and Foreign Direct Investment: Outcomes Unveiled by Robust Statistical Models in the Example of Greece [1]

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## Abstract

*This study examines whether the terrorist attacks impact foreign direct investments to Greece, with as much up-to-date data as possible. In this framework, hypotheses are tested within the framework of relational models through the data between 1970 and 2020. The results show a medium correlation between terrorist attacks and foreign direct investment, which is statistically significant. There is also a slightly higher correlation between terrorist attacks and foreign direct investment as a parameter of gross domestic product, which is statistically significant. Moreover, as the robust regression analysis shows, there is a bidirectional causal relationship between the variables. However, with complete data, there appears to be a causality tendency between variables by increasing foreign direct investment in the short term. At the same time, the results reveal causality from foreign direct investment to terrorist attacks.*

**Keywords:** *Foreign Direct Investment, Greece, Relational Models, Robust Regression*

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[1] This study does not require ethics committee permission.

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# Terör Olayları ve Doğrudan Yabancı Yatırım: Yunanistan Örneğinde Dayanıklı İlişkisel Modellerin Ortaya Çıkardığı Sonuçlar

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**Başvuru Tarihi:** 18.07.2024 **Kabul Tarihi:** 07.11.2024 **Makale Türü:** Araştırma Makalesi

## Öz

*Bu çalışma, terör saldırılarının Yunanistan'a yapılan doğrudan yabancı yatırımları etkileyip etkilemediğini mümkün olan en güncel verilerle incelemektedir. Bu çerçevede 1970-2020 yılları arasındaki veriler üzerinden hipotezler, ilişkisel modeller çerçevesinde test edilmektedir. Sonuçlar terör saldırıları ile doğrudan yabancı yatırım arasında istatistiksel olarak anlamlı orta düzeyde bir korelasyon olduğunu göstermektedir. Gayri safi yurt içi hasıla parametresi olarak terör saldırıları ile doğrudan yabancı yatırımlar arasında istatistiksel olarak anlamlı olan biraz daha yüksek bir korelasyon vardır. Ayrıca, dayanıklı regresyon analizinin gösterdiği gibi değişkenler arasında çift yönlü bir nedensellik ilişkisi bulunmaktadır. Ancak tam verilerle kısa vadede terör saldırılarından doğrudan yabancı yatırımlara doğru, doğrudan yabancı yatırımları artırmak suretiyle bir nedensellik eğilimi olduğu görülmektedir. Aynı zamanda doğrudan yabancı yatırımlardan terör saldırılarına doğru nedensellik söz konusudur.*

**Anahtar Kelimeler:** *Doğrudan Yabancı Yatırım, Yunanistan, İlişkisel Modeller, Dayanıklı Regresyon*

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**Introduction**

In assessing whether terrorism impacts foreign direct investment, the results avoid theorizing.[6] In fact, it may be a matter of curiosity whether any country's experience has changed over time. In this sense, even measurements (statistical evaluations) made at regular intervals are essential regarding whether a previously reached result can be confirmed.

However, individual country experiences can be analyzed more closely to investigate whether common causes lead to a typical result. Thus, it is possible to make inferences about whether the terrorism typology (right or left organization, national or international organization, and so forth) affects foreign direct investment.

In a study that refers to the typology of terrorism, Meierrieks and Gries (2013: 91-104) arrive at the following conclusions. While left-wing organizations dominated during the Cold War, religious-motivated organizations were dominant in the post-Cold War period. In this sense, terrorism has shifted from West and Latin America to Africa and Islamic countries. In other words, left-wing terrorism with economic justifications has declined, and other types of terrorism without economic roots have increased. However, the primary concern of Meierrieks and Gries in that work, unlike this study, is to examine the relationship between welfare and terrorism.

In fact, an overview shows that the relationship between terrorism and tourism is dominantly examined in the general literature.[7] Similarly, studies related to terrorism in Greece share the same path. The work of Samitas et al. shows that there is a unidirectional causality running from terrorism to tourism. The authors' conclusions are based on data from 1977 to 2012 made through cointegration and Granger causality tests (Samitas, Asteriou, Polyzos& Kenourgios, 2018, pp.23-28). However, there needs to be a record of whether the data has a normal distribution in that study.

However, it is possible to come across studies on politics and the economy. Kassimeris, for example, evaluates the failure of Greece in the fight against terrorism through the organizations November 17 and Epanastatikos Laikos Agonas (ELA - Revolutionary People's Struggle). The main reasons for this failure are the policymakers' insistence on treating terrorism as a foreign plan and ignoring chronic public dissatisfaction (Kassimeris, 1995, pp.74-92).

Another study in the political context belongs to Karyotis. In his study, he evaluated the Revolutionary Organization November 17, the most dangerous organization in Greece, concerning the securitization theory developed by the Copenhagen school. According to him, the reason for the failure of the state in the fight against terrorism in Greece was the false belief that terrorism was not a direct threat to Greek security (Karyotis, 2007, pp.271-293).

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[6] To illustrate, Rasheed and Tahir conclude that terrorist attacks harm foreign direct investment in the Pakistan case. In contrast, Ak and Inal conclude that no causal relationship exists between the two variables in Türkiye's case. For details, see Hafsa Rasheed and Muhammad Tahir, "FDI and Terrorism: Co-Integration & Granger Causality," International Affairs and Global Strategy, Volume 4, 2012, pp. 1-5, and see Zeki Ak and Veysel Inal, "Terrorism and Foreign Direct Investment in Türkiye: Hidden Cointegration and Asymmetric Causality Relationship", Bilgi, Volume 35, Winter 2017, pp. 27-43.

[7] It is possible to say that studies on the effect of terrorism on tourism have relatively more space in the literature. In this context, see Abraham Pizam and Ginger Smith, "Tourism and Terrorism: A Quantitative Analysis of Major Terrorist Acts and Their Impact on Tourism Destinations," Tourism Economics, Volume 6, Number 2, June 2000, pp. 123-138. Tomáš Krajňák, "The Effects of Terrorism on Tourism Demand: A Systematic Review," Tourism Economics Volume 27, Number 8, July 2020, 1736-1758. Gabrielle Walters, Ann Wallin, and Nicole Hartley, "The Threat of Terrorism and Tourist Choice Behavior", Journal of Travel Research, Volume 58, Number 3, February 2018, pp. 370-382. Marion Karl, Gordon Winder, and Alexander Bauer, "Terrorism and Tourism in Israel: Analysis of the Temporal Scale," Tourism Economics, Volume 23, Number 6, December 2016, 1343-1352. Ogen S. Goldman and Michal Neubauer-Shani, "Does International Terrorism Affect Transnational Tourism", Journal of Travel Research, Volume 56, Number 4, August 2016, pp. 451-467. Alexi Thompson, "Terrorism and Tourism in Developed versus Developing Countries," Tourism Economics, Volume 17, Number 3, June 2011, pp. 693-700. David Leslie, "Terrorism and Tourism: The Northern Ireland Situation—A Look behind the Veil of Certainty", Journal of Travel Research, Volume 38, Number 1, August 1999, pp. 37-40.

As for the impact of terrorism on the economy, Gazopoulou's working paper written for the Bank of Greece in 2011, related to the impact of terrorism abroad on travel (tourism) to Greece, does not essentially produce a result other than what is predicted. In this study, which investigates whether there is a long-term cointegration and short-term relationship, Gazopoulou evaluates that a significant terrorist attack on a global scale has a negligible effect on Greek tourism empirically. Tourism in Greece is more affected by income, domestic price changes, and external price trends than terrorism (Bank of Greece Economic Research Department, 2023). However, it should be underlined that the terrorism here is not domestic terrorism; it is terrorism taking place outside the country.

The study of Liargovas and Repousis on the effect of foreign terrorism on Greek banks' stocks draws attention. The basic limit in that study is three attacks. These are the September 11, London, and Madrid attacks. While the Madrid terrorist attack did not significantly influence the Greek banks' stocks, September 11 and the London attack had significant negative returns in the Greek banks' stocks. The authors, who attribute the significant effect of September 11 to the fact that the event took place in the USA, which dominates the world economy, also attribute the abnormally large negative returns as a result of the New York and London attacks to the fact that the events could be partially predicted (Liargovas and Repousis, 2010, pp.87-96).

Enders and Sandler's study is the closest article to this study in terms of aim. Nevertheless, the data in that study cover 24 years between 1968 and 1991. In that article, the authors examined whether terrorist attacks impacted net foreign direct investment in the case of Spain and Greece. Unlike this study, the authors used the vector-autoregression (VAR) model and assumed the data had a normal distribution. However, the data regarding Greece does not have a normal distribution. In addition, they used dummy variables for missing data in the time series of that study (Enders &Sandler, 1996, pp. 331-352). Their study found only a one-way relationship from terrorist events to foreign direct investment to Greece.

**The Study's Purpose and Importance**

This study aims to comment on whether the terrorist attacks in Greece affect foreign direct investment. To this end, the two correlation hypotheses will be tested.[8] Hypothesis 1 states that the number of terrorist incidents per year affects foreign direct investments ($H1_o$:r=0 and $H1_1$:r≠0). Hypothesis 2 states that the number of terrorist incidents per year affects the share of foreign direct investment in Greece's gross domestic product ($H2_o$:r=0 and $H2_1$:r≠0). Besides, the regression hypothesis $H_0$: $\beta_1$=0 and $H_1$: $\beta_1$≠0 will be tested. If the standard regression is unsuitable for analysis, it will be tried to conclude with advanced analysis. Table 1 below shows the null hypotheses of advanced regression analysis. In this sense, null hypotheses indicate that there is no causal relationship between the dependent variable and the independent variable. This is valid for both time series with missing data and time series with missing data completed by various methods.

This study evaluates, updates, and develops information about Greece using the most comprehensive data possible. In addition, the literature review indicates that an evaluation of this subject can be seen as a contribution because this study covers content that has not been done before. Moreover, as will be touched upon in the literature review section, the literature mainly focuses on the relationship between terrorism – concerning terrorist attack numbers in particular- and economic parameters. Therefore, this study may also have a different potential for theorizing the relationship between the terrorist organization profile and foreign direct investment. In this sense, the results of this study may provide the emergence of new theoretical approaches with the examinations to be made by other potential researchers by considering the parameter of

[8] Notwithstanding that correlation analysis does not establish a causal relationship between the variables and investigates the effects of the variables on each other, terrorist attacks are considered as an independent variable here.

terrorism typology with the experiences of other countries on whether the terrorism typology [9] affects foreign direct investments.

Table 1
Hypotheses Result to be Tested for Advanced Analysis of Greece[10]

| Result<br>Null Hypothesis | $H_o$ | $H_1$ |
|---|---|---|
| TI is not the cause of FDI | ? | ? |
| $TI_{alternative}$ is not the cause of FDI | ? | ? |
| FDI is not the cause of TI | ? | ? |
| FDI is not the cause of $TI_{alternative}$ | ? | ? |
| TI is not the cause of FDI as percentage of GDP | ? | ? |
| $TI_{alternative}$ is not the cause of FDI as percentage of GDP | ? | ? |
| FDI as percentage of GDP is not the cause of TI | ? | ? |
| FDI as percentage of GDP is not the cause of $TI_{alternative}$ | ? | ? |

**Conceptual and Theoretical Framework**

This study defines terrorism with reference to Global Terrorism Database (GTD). Political, economic, ecclesiastical, or social purposes design the action. Cultivating benefits alone is not enough about economic objectives. Systemic economic shifts have to be targeted. It is not of importance if each personal acting is aware of this end (University of Maryland, 2023).

From theoretical perspective, this study will contribute to the country sample pool regarding whether a causal relationship can be established between the variables.

**Modus Operandi**

The quantitative research model is valid in this study. In this context, correlation and regression analysis will be conducted. The research sample consists of 1,386 terrorist incidents between 1970 and 2020. The datum's disposal is below as of October 25, 2023—because updates are made in the GTD regularly, the data belonging to the last review made on October 25, 2023, have been taken into account. The distribution of these data by years is as follows.

[9] For a study of the terrorism typology, including the reference to the O'Conner typology, one of the first important comprehensive typologies, see Mahir Terzi and Serkan Yenal, "Terrorism," International Security, (ed). Nejat Dogan, Eskisehir: Anadolu University Press, 2019, pp. 159-186.

[10] Abbreviations in the table are as follows. TI stands for Terrorist Incidents in Greece. $TI_{alternative}$ stands for data for 1993, which needs to be added to the data set. For this reason, the missing data has been filled out with the arithmetic mean for a robust analysis. In case of missing data in the time series, there are various methods for trying to cast about missing data, including 1) complementing the missing data with the arithmetic mean, 2) using previous period data (under conditions where fluctuation is not high), 3) using the moving average method, or 4) regression estimation (by adding the trend as an independent variable). For detail, see, Ondokuz Mayis University, "Zaman Serilerinde Temel Kavramlar," https://avys.omu.edu.tr/storage/app/public/vceyhan/109842/ZAMAN%20 SER%C4%B0LER%C4% B0NDE% 20 TEMEL%20KAVRAMLAR.pdf, (21 Febraury 2023). Hence, this variable is expressed as $TI_{alternative}$. FDI stands for Foreign Direct Investment to Greece. GDP stands for Gross Domestic Product. FDIaspercentageofGDP stands for Foreign Direct Investment to Greece as percentage of Gross Domestic Product. GTD stands for Global Terror Database.

Table 2
Terrorist Event Statistics by Year for Greece

| Year | Event Number | Year | Event Number | Year | Event Number | Year | Event Number |
|---|---|---|---|---|---|---|---|
| 1970 | 3 | 1984 | 28 | 1998 | 28 | 2012 | 24 |
| 1971 | 1 | 1985 | 35 | 1999 | 35 | 2013 | 56 |
| 1972 | 2 | 1986 | 41 | 2000 | 28 | 2014 | 27 |
| 1973 | 11 | 1987 | 26 | 2001 | 14 | 2015 | 30 |
| 1974 | 6 | 1988 | 38 | 2002 | 10 | 2016 | 30 |
| 1975 | 4 | 1989 | 50 | 2003 | 12 | 2017 | 44 |
| 1976 | 21 | 1990 | 55 | 2004 | 4 | 2018 | 26 |
| 1977 | 47 | 1991 | 57 | 2005 | 6 | 2019 | 32 |
| 1978 | 39 | 1992 | 35 | 2006 | 23 | 2020 | 50 |
| 1979 | 9 | 1993 | 28 | 2007 | 15 | Year 1993 as missing data has been evaluated via arithmetic mean. | |
| 1980 | 15 | 1994 | 42 | 2008 | 53 | | |
| 1981 | 20 | 1995 | 8 | 2009 | 115 | | |
| 1982 | 19 | 1996 | 20 | 2010 | 49 | | |
| 1983 | 11 | 1997 | 21 | 2011 | 11 | | |

Data on terrorist incidents for 1993 are not available (Figure 1). Since there is missing data in the data set, the missing data is considered by the arithmetic mean, which is 28 (27.72). Therefore, calculations are made on both the original data, including missing data for 1993, and the result obtained by completing the missing data via arithmetic mean ($TI_{alternative}$).

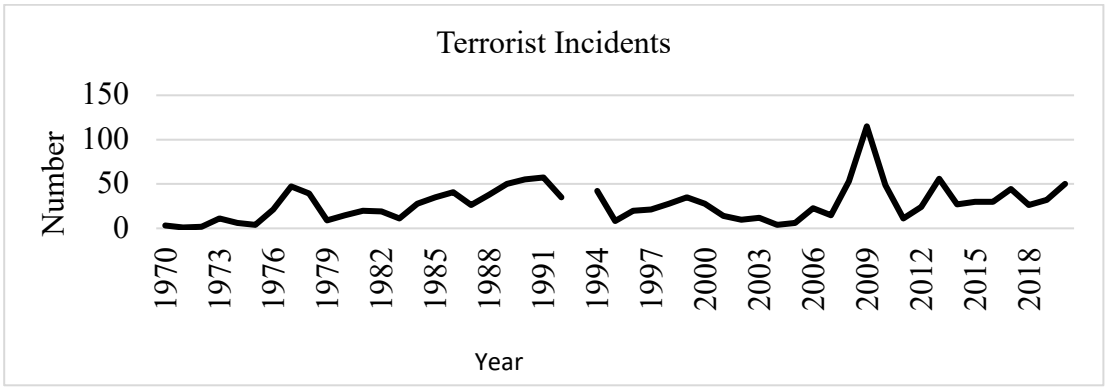



Figure 1. Terrorist Incidents by Years

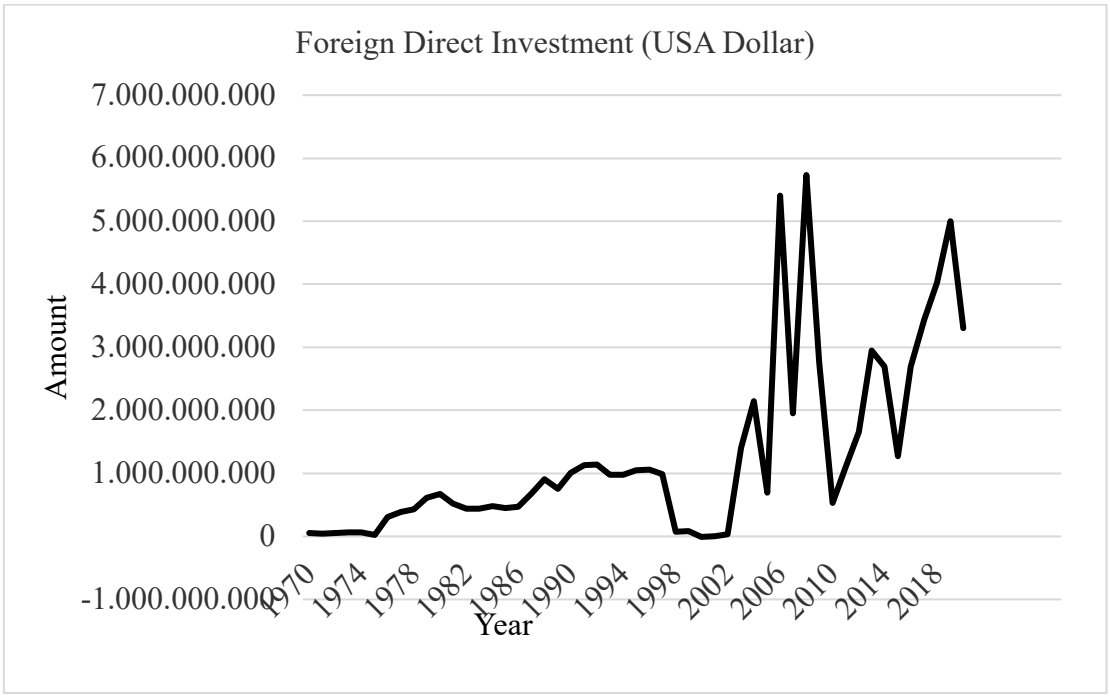



Figure 2. Foreign Direct Investment by Years

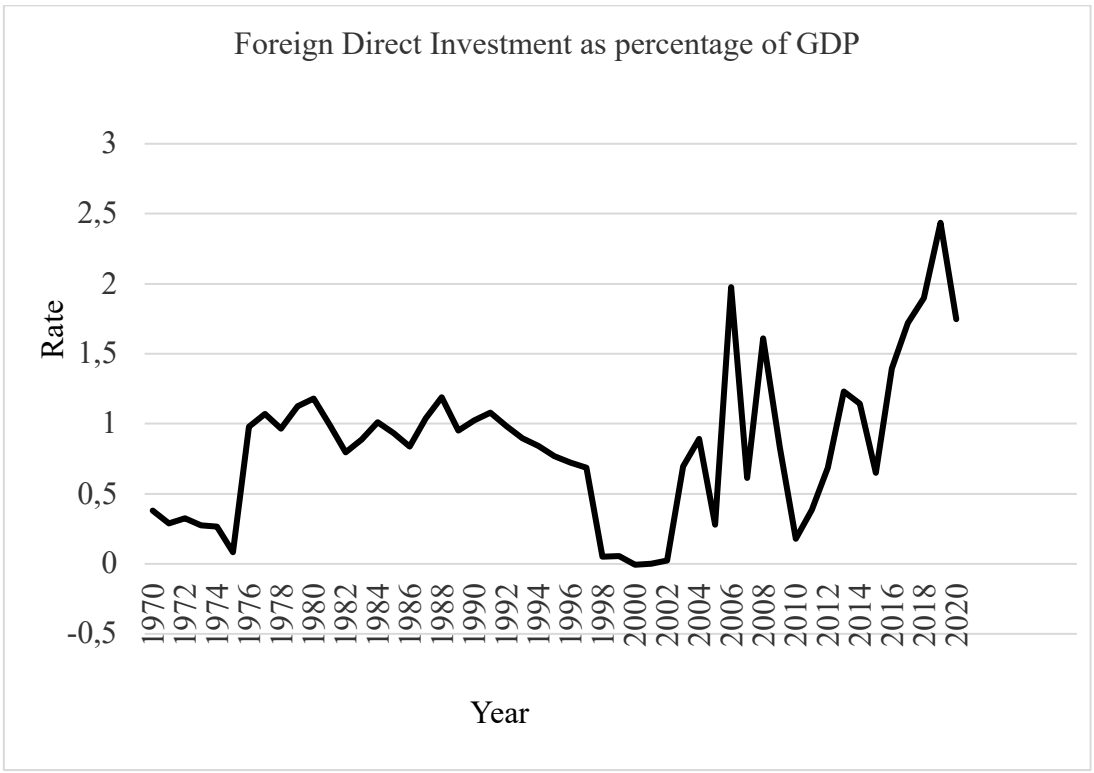



Figure 3. Foreign Direct Investment as a percentage of GDP by Years

The principal limit of the study consists of two basic parameters, which are the subject of the study, including the number of TI and the amount of FDI. The data subject to the study is between 1970 and 2000. Throughput about the score of terrorist attacks is based on the Global Terror Database (GTD) created and followed by the University of Maryland (2023). This site has been checked regularly; the latest data was analyzed on October 25, 2023. As for FDI data, those are based on the World Bank database (World Bank, 2023). Data on Greece are taken into account in both databases. According to GTD, the first terrorist attack for which information is available was carried out towards the United States Embassy via bombing/explosion in 1970. The last attack in the relevant database was carried out towards the Athens Municipal Police Building through bombing/explosion on December 31, 2020.

The study assumes that terrorism has a high deterrent effect on foreign direct investments to Greece.

## Findings

Before analyzing and rooting around the data, it is essential to know whether each variable has a normal distribution. Appendices 1 and 2 show the results of the normality tests.[11] The data for variables in Appendix 1 show that the variables do not have a normal distribution. As seen from the data in Appendix 1, the data of the variables are not within the reference ranges required for the normality test. When the variables in Appendix 2 are considered as a whole, they also do not meet the normal distribution condition.

Figure 4 also confirms these results by marking extreme observations. Data number 40 (year 2019) in Figure 4 distorts the normal distribution of terrorist incidents. The data numbered 37 (the year 2016), 39 (the year 2008), 48 (the year 2017), 49 (the year 2018), 50 (the year 2019), and 51 (the year 2020) in Appendix 3 also shows that the FDI does not show a normal distribution and has extreme values.

### Correlation Analysis[12] and Obtained Data

*Hypothesis 1: the number of terrorist incidents by year affects foreign direct investments to greece.* $H1_0$: $r^2=0$ $h1_1$: $r^2\neq0$

Appendix 1 shows that both variables subject to the analysis for hypothesis 1 have a non-normal distribution. Figure 4 also illustrates that the variables do not prove a normal distribution. Therefore, the spearman correlation test ($r_s$), suitable for non-normal distribution as opposed to the pearson correlation test that is suitable for normal distribution, is performed.[13]

[11] For normality test reference ranges, see Tez Yardim Platformu, "Testing the Normal Distribution with SPSS," https://www.youtube.com/watch?v=4cekTDfqvWE, (24 December 2022).

[12] Correlation analysis is a statistical technique used to reveal whether there is a linear relationship between two variables and, if so, its direction and strength. For details, see Hasan Durucasu, "Regression and Correlation Analysis", *Statistics II*, (eds.) Emel Sıklar and Ali Ozdemir, Eskisehir, Anadolu University Press, 2019, pp. 117-137.

[13] If even one of the variables does not have a normal distribution, then the Spearman-Brown rank correlation coefficient is applied instead of the Pearson correlation coefficient. For details, see Tez Yardim Platformu, "Binary (Simple) Correlation Analysis with SPSS and Writing Findings",https://www.youtube.com/watch?v=95n9WtdoUR8, (20 December 2022).

Table 3
Spearman Correlation Results for Hypothesis 1

| | | Terrorist Incidents | Foreign Direct Investment |
|---|---|---|---|
| Terror Incidents | Spearman's rho ($r_s$) | 1 | .423** |
| | Sig. (2-tailed) | | .002 |
| | N | 50 | 50 |
| Foreign Direct Investment | Spearman's rho ($r_s$) | .423** | 1 |
| | Sig. (2-tailed) | .002 | |
| | N | 50 | 51 |

** Correlation is significant at the 0.01 level (2-tailed).

The spearman correlation test indicates a moderate relationship between the variables; this rate is 42.3 percent ($r_s$=0.423). The coefficient of determination (explained variance or $r^2$), the rate of explaining the relationship between the variables, is 17.89 percent ($r^2$=$0.423^2$). Spearman correlation test also indicates that the result is statistically significant because the significance value (0.002) is smaller than 0.01 ($p<0.01$). Hence, the alternative hypothesis ($h1_1$: $r^2\neq0$) is accepted.

*Hypothesis 2: the number of terrorist incidents by year affects the share of foreign direct investment in the gross domestic product of greece. $H2_0$: $r^2=0$ and $h2_1$: $r^2\neq0$*

Appendix 2 shows that both variables subject to the analysis for hypothesis 2 have a non-normal distribution. Figure 4 also illustrates that the variables do not prove a normal distribution. The spearman correlation test, therefore, is performed. The spearman correlation test indicates a moderate relationship between the variables, and this rate is 47.2 percent ($r_s$=0.472). The explained variance ($r^2$), the rate of explaining the relationship between the variables, is 22.27 percent ($r^2$=$0.472^2$). Spearman correlation test indicates that the result is statistically significant because the significance value (0.001) is smaller than 0.01 ($p<0.01$). Hence, alternative hypothesis ($h2_1$: $r^2\neq0$) is accepted.

The motivation for this hypothesis is obvious: foreign direct investment is one of the factors affecting the gross domestic product, but it is not the only factor. Therefore, it is important to see its place among other parameters that affect the gross domestic product. For this reason, the percentage values taken in the hypothesis are included.

Table 4
Spearman Correlation Results for Hypothesis 2

| | | Terrorist Incidents | Foreign Direct Investment as percentage of GDP |
|---|---|---|---|
| Terror Incidents | Spearman's rho ($r_s$) | 1 | .472** |
| | Sig. (2-tailed) | | .001 |
| | N | 50 | 50 |
| Foreign Direct Investment | Spearman's rho ($r_s$) | .472** | 1 |
| | Sig. (2-tailed) | .001 | |
| | N | 50 | 51 |

** Correlation is significant at the 0.01 level (2-tailed).

***Regression analysis and obtained data***

Since the variables in both hypotheses show non-normal distribution, as Appendices 1 and 2 show, they are not suitable for regression analysis.[14] In other words, even if the result of the regression analysis is a meaningful statistic, this will be misleading because the data of the variables need to provide one of the prerequisites for regression analysis. That is, the normal distribution condition is not met. There are extreme values in the series. For this reason, advanced analyzes suitable for time series will be operated. Thus, it will be examined whether there are short-term relationships, long-term relationships (cointegration), and structural breaks among the variables since standard causality analysis has failed to perform.

***Advanced test results for regression analysis***

First, a series with normal distribution is observed for a healthy analysis. As detailed above shows, the series does not have a normal distribution. There are methods, including taking differentiation and taking logarithms, which can be applied for the series with non-normal distribution to convert into normal distribution (Ceyhan & Gunduz, 2023). However, for these time series, the methods, such as taking differentiation and logarithm, do not provide a normal distribution of the data as well.

When the first difference of the series is taken, it is seen that only the FDI as percentage of GDP series exhibits a normal distribution. TI, $TI_{alternative,}$ and FDI variables do not show a normal distribution when their first differences are taken. The fact that the FDI as a percentage of GDP variable has a normal distribution when

[14] The mathematical model that will express the relationship between two or more variables is investigated in regression analysis. The relationship between the two mentioned variables usually occurs as a cause-effect relationship. For details, see Hasan Durucasu, "Regression and Correlation Analysis", *Statistics II*, (eds.) Emel Sıklar and Ali Ozdemir, Eskisehir, Anadolu University Press, 2019, pp. 117-137. Regression analysis requires specific criteria to be met. Some of these are done before the analysis, and some are done during the analysis. These criteria are shown below. The first three of these are done before the analysis. When these conditions are met, it can be passed to the others. Criterion 1: The dependent variable should be equally spaced or proportionally measured and a continuous variable. Criterion 2: Both variables should have a normal distribution. Criterion 3: There should be a linear relationship between the variables. Criterion 4: There should be no extreme values. Standard Residual value should be between -3.29 and +3.29. Criterion 5: Cook Distance value should be a maximum of 1. Criterion 6: Errors should be normally distributed. Criterion 7: Variables should be covariate. Criterion 8: Errors should be independent of each other. Durbin-Watson coefficient should be between 0 and 4. Here, it is seen that the second criterion is not met, so traditional regression analysis cannot be performed. For the regression criteria mentioned above, see Tez Yardim Platformu, "Simple Linear Regression Analysis with SPSS", https://www.youtube.com/watch?v= JAAN73QF9e8, (23 December 2022).

the difference is taken is due to the GDP effect because the GDP series had a normal distribution (without difference). In the second difference, all variables, including FDI as a percentage of GDP, are in a non-normal distribution.

When the logarithms of the TI and $TI_{alternative}$ series are taken, it is seen that they do not exhibit a normal distribution. FDI and FDI as a percentage of the GDP series' logarithms cannot be taken because their series has negative values. Therefore, a robust least squares (RLS)[15] analysis is performed for a non-normal distribution in determining possible short-term affiliation.[16] The M-estimation (Huber, 1973, pp.799-821) considers the dependent variable extremes. On the other hand, the S-estimation (Rousseauw & Yohai, 1984, pp.256-272) considers the independent variable (regressor) extremes. MM-estimation (Yohai, 1987, pp.642-656) is a suitable regression analysis for this study, as it takes into account acute values for both dependent and independent variables (EViews, 2023).

In this framework, the following relationships are examined, taking into account the potential aspects of the relationship via MM-estimation.

- Does FDI as an independent variable affect TI as a dependent variable?
- Does TI as an independent variable affect FDI as a dependent variable?
- Does TI as an independent variable affect FDI as a percentage of GDP as a dependent variable?
- Does FDI as a percentage of GDP as an independent variable affect TI as a dependent variable?

In addition, as mentioned before, there is no data for 1993 in the TI time series. Once this deficiency is corrected with the arithmetic mean (Ondokuz Mayis University, 2023), it will also be evaluated whether the results are changed. Hence, the new variable has been defined as $TI_{alternative}$, and the above relations will be re-examined within the framework of $TI_{alternative}$ as well.

Table 5
Robust Regression Analysis for TI and FDI

Dependent Variable: TI
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 50
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| FDI | 3.90E-09 | 1.66E-09 | 2.346910 | 0.0189 |
| C | 20.58326 | 3.205616 | 6.421000 | 0.0000 |
| | Robust Statistics | | | |
| R-squared | 0.091462 | Adjusted R-squared | | 0.072534 |
| Rw-squared | 0.129890 | Adjust Rw-squared | | 0.129890 |
| Akaike info criterion | 44.60140 | Schwarz criterion | | 49.60611 |
| Deviance | 12778.92 | Scale | | 17.48848 |
| Rn-squared statistic | 5.507986 | Prob(Rn-squared stat.) | | 0.018930 |

[15] Another important reason for applying RLS is the lack of cointegration in the series. Therefore, it is unsuitable for performing other tests, such as the Granger causality test. Since there is no normal distribution, analyzes questioning the short-term relationship, such as VAR analysis, cannot be performed. The statistical results show that the time series is stationary at the level and has a constant and trend because t statistics with constant and trend are higher than the others are. PP and ADF unit root tests show no cointegration, and the time series is stationary at level. The results of both tests overlap with each other.

[16] Ordinary least squares (OLS) estimators are responsive to observations outside the regression model standard. Traditional regression methods' tenderness to these outlier observations could result in coefficient estimates that only partially picture the underlying statistical connection. However, robust least squares apply to various regression methods projected to be robust or less delicate to outliers. For details, see EViews, "Robust Regression in EViews 8", https://eviews.com/ EViews8/ev8ecrobust_n.html (16.03.2023).

The coefficient values of the variables (the constant (C) and independent variable FDI) are statistically significant. Significance values are 0.0000 and 0.0189, respectively ($p<0.05$). The coefficient of determination ($R^2$) is 0.09 (0.091462). In other words, the ratio of the independent variable to explain the dependent variable is nearly 9 percent. The equation is formulated as follows. Terrorist attacks are affected by direct foreign investments to Greece.

$$TI=20.58326+3.90E\text{-}09FDI \quad \text{(Equation 1)}$$

According to this equation, for example, one billion dollars of foreign direct investment causes approximately four (3.9) terrorist incidents, with the inclusion of Constant approximately 24 (24.48) terrorist attacks.

Table 6
Robust Regression Analysis for $TI_{alternative}$ and FDI

Dependent Variable: $TI_{alternative}$
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 51
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| FDI | 3.89E-09 | 1.64E-09 | 2.372399 | 0.0177 |
| C | 20.67977 | 3.139176 | 6.587644 | 0.0000 |

| Robust Statistics | | | |
|---|---|---|---|
| R-squared | 0.091038 | Adjusted R-squared | 0.072488 |
| Rw-squared | 0.129281 | Adjust Rw-squared | 0.129281 |
| Akaike info criterion | 44.99479 | Schwarz criterion | 50.07040 |
| Deviance | 12755.97 | Scale | 17.38464 |
| Rn-squared statistic | 5.628276 | Prob(Rn-squared stat.) | 0.017673 |

The coefficient values of the variables (the constant (C) and independent variable FDI) are statistically significant. Significance values are 0.0000 and 0.0177($p<0.05$), respectively. The explained variance ($R^2$) is 0.09 (0.091038). In other words, the ratio of the independent variable to explain the dependent variable is about 9 percent. The equation is formulated as follows. Terrorist attacks are affected by direct foreign investments to Greece.

$$TI_{alternative}=20.67977+3.89E\text{-}09FDI \quad \text{(Equation 2)}$$

According to this equation, for example, one billion dollars of foreign direct investment causes approximately four (3.89) terrorist incidents, with the inclusion of Constant approximately 24 (24.57) terrorist attacks.

Table 7
Robust Regression Analysis for FDI and TI

Dependent Variable: FDI
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 50
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| TI | 17669151 | 5660060. | 3.121725 | 0.0018 |
| C | 3.11E+08 | 1.94E+08 | 1.601373 | 0.1093 |
| | Robust Statistics | | | |
| R-squared | 0.081516 | Adjusted R-squared | | 0.062381 |
| Rw-squared | 0.243512 | Adjust Rw-squared | | 0.243512 |
| Akaike info criterion | 87.78759 | Schwarz criterion | | 92.33145 |
| Deviance | 3.79E+19 | Scale | | 6.69E+08 |
| Rn-squared statistic | 9.745168 | Prob(Rn-squared stat.) | | 0.001798 |

Whereas the coefficient value of Constant (C) is not statistically significant, TI's coefficient value is statistically significant. Significance values are 0.1093 ($p>0.10$) and 0.0018 ($p<0.05$), respectively. The explained variance ($R^2$) is nearly 0.082 (0.081516). In other words, foreign direct investment to Greece is not affected by terrorist attacks. However, when the missing data on the TI time series are completed with the arithmetic mean (28), a causality that is significant at the 10 percent level ($p<0.10$) is observed, as shown below.

Table 8
Robust Regression Analysis for FDI and $TI_{alternative}$

Dependent Variable: FDI
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 51
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| $TI_{alternative}$ | 17696539 | 5551242. | 3.187852 | 0.0014 |
| C | 3.16E+08 | 1.90E+08 | 1.660888 | 0.0967 |
| | Robust Statistics | | | |
| R-squared | 0.082165 | Adjusted R-squared | | 0.063434 |
| Rw-squared | 0.243538 | Adjust Rw-squared | | 0.243538 |
| Akaike info criterion | 87.85937 | Schwarz criterion | | 92.51419 |
| Deviance | 3.79E+19 | Scale | | 6.69E+08 |
| Rn-squared statistic | 10.16240 | Prob(Rn-squared stat.) | | 0.001433 |

While the coefficient value of Constant (C) is statistically significant at one percent level, $TI_{alternative}$'s coefficient value is statistically significant at ten percent level. Significance values are 0.0967 ($p<0.10$) and 0.0014 ($p<0.01$) respectively. The explained variance ($R^2$) is nearly 0.082 (0.082165). In other words, the ratio of the independent variable to explain the dependent variable is 8.2 percent. Foreign direct investment to Greece is affected by terrorist attacks (without missing data). Nonetheless, although significance at the 10 percent level is not a preferred situation, some approaches in the literature consider the causality tendency for $0.05\leq p<0.10$. In this sense, it can be said that there is a *causality tendency*,[17] if not causality.

$$FDI=3.16E+08+17696539TI_{alternative} \text{ (Equation 3)}$$

However, the positive coefficient on $TI_{alternative}$ indicates that terrorist attacks increase foreign direct investment in the short term. This result either indicates a spurious causality or shows that foreign direct investment increased in the short term due to reasons such as international political decisions or increased consumption to replace the loss of welfare suffered due to terrorism. According to this equation, for example, ten terrorist attacks increase the amount of foreign direct investment to Greece by 159,268,851 USD in the short term-159,268,851 USD, for example, refers to the difference created by the equation when the terrorist attack increases from one to ten.

Table 9
Robust Regression Analysis for TI and FDI as percentage of GDP

Dependent Variable: TI
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 50
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| FDIaspercentageof GDP | 13.23112 | 4.205393 | 3.146228 | 0.0017 |
| C | 14.23445 | 4.223747 | 3.370100 | 0.0008 |
| | Robust Statistics | | | |
| R-squared | 0.155806 | Adjusted R-squared | | 0.138219 |
| Rw-squared | 0.214967 | Adjust Rw-squared | | 0.214967 |
| Akaike info criterion | 46.59594 | Schwarz criterion | | 51.46226 |
| Deviance | 11480.08 | Scale | | 16.21956 |
| Rn-squared statistic | 9.898751 | Prob(Rn-squared stat.) | | 0.001654 |

[17] For causality tendency, see Akbulut, Omer. (2022). "Current approaches in reporting statistical significance in scientific research: Errors and truths." International Journal of Eastern Mediterranean Agricultural Research, *5*, 01-19.

The coefficient values of the variables (the constant (C) and FDI as a percentage of GDP as an independent variable) are statistically significant. Probability (significance) values are 0.0008 and 0.0017, respectively ($p<0.05$ and $p<0.01$)). The explained variance ($R^2$) is 0.15 (0.155806). In other words, the ratio of the independent variable to explain the dependent variable is nearly 15.6 percent. The equation is formulated as follows. Terrorist attacks are affected by direct foreign investment as parameter of GDP.

TI=14.23445+13.23112 FDI as a percentage of GDP (Equation 4)

According to this equation, for example, when foreign direct investment, which constitutes one percent of the gross domestic product, increases to two percent, the score of terrorist attacks increases from approximately 14.37 to 14.50.

Table 10
Robust Regression Analysis for $TI_{alternative}$ and FDI as a percentage of GDP

Dependent Variable: $TI_{alternative}$
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 51
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| FDIaspercentageof GDP | 13.26155 | 4.162905 | 3.185649 | 0.0014 |
| C | 14.21909 | 4.172836 | 3.407536 | 0.0007 |
| | Robust Statistics | | | |
| R-squared | 0.156488 | Adjusted R-squared | | 0.139273 |
| Rw-squared | 0.216652 | Adjust Rw-squared | | 0.216652 |
| Akaike info criterion | 48.78991 | Schwarz criterion | | 53.60066 |
| Deviance | 11323.03 | Scale | | 15.73430 |
| Rn-squared statistic | 10.14836 | Prob(Rn-squared stat.) | | 0.001444 |

The coefficient values of the variables (the constant (C) and FDI as a percentage of GDP as an independent variable) are statistically significant. Probability (significance) values are 0.0007 and 0.0014, respectively ($p<0.05$ and $p<0.01$). The explained variance ($R^2$) is 0.156 (0.156488). In other words, the ratio of the independent variable to explain the dependent variable is roughly 15.6 percent. The equation is formulated as follows. Terrorist attacks are affected by direct foreign investments to Greece (in the absence of missing data).

$TI_{alternative}$=14.21909+13.26155FDI as percentage of GDP (Equation 5)

According to this equation, for example, when foreign direct investment, which constitutes one percent of the gross domestic product, increases to two percent, the score of terrorist attacks increases from approximately 14.35 to 14.48.

Table 11
Robust Regression Analysis for FDI as a percentage of GDP and TI

Dependent Variable: FDI as percentage of GDP
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 50
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| TI | 0.010263 | 0.003468 | 2.959028 | 0.0031 |
| C | 0.523423 | 0.119137 | 4.393460 | 0.0000 |
| | Robust Statistics | | | |
| R-squared | 0.123471 | Adjusted R-squared | | 0.105210 |
| Rw-squared | 0.191859 | Adjust Rw-squared | | 0.191859 |
| Akaike info criterion | 62.02217 | Schwarz criterion | | 66.22015 |
| Deviance | 10.03939 | Scale | | 0.414631 |
| Rn-squared statistic | 8.755844 | Prob(Rn-squared stat.) | | 0.003086 |

The coefficient values of the variables (the constant (C) and independent variable TI) are statistically significant. Significance values are 0.0000 and 0.0031, respectively ($p<0.05$ and $p<0.01$)). The explained variance ($R^2$) is 0.123 (0.123471). In other words, the ratio of the independent variable to explain the dependent variable is about 12 percent. The equation is formulated as follows. Terrorist attacks are affected by direct foreign investment as a parameter of GDP.

FDI as a percentage of GDP=0.523423+0.010263TI (Equation 6)

According to this equation, for example, when the number of terrorist attacks increases from one to ten, the ratio of foreign direct investment in gross domestic product increases by approximately 1.17 times from 0.533686 to 0.626053, and when the number of terrorist attacks increases from one to five hundred, the ratio of foreign direct investment in gross domestic product increases by approximately 10.60 times from 0.533686 to 5.654923.

Table 12
Robust Regression Analysis for FDI as a percentage of GDP and $TI_{alternative}$

Dependent Variable: FDI as percentage of GDP
Method: Robust Least Squares
Sample: 1970 2020
Included observations: 51
Method: MM-estimation

| Variable | Coefficient | Std. Error | z-Statistic | Prob. |
|---|---|---|---|---|
| $TI_{alternative}$ | 0.010401 | 0.003400 | 3.059443 | 0.0022 |
| C | 0.520989 | 0.116391 | 4.476191 | 0.0000 |
| | Robust Statistics | | | |
| R-squared | 0.123944 | Adjusted R-squared | | 0.106065 |
| Rw-squared | 0.198473 | Adjust Rw-squared | | 0.198473 |
| Akaike info criterion | 64.71947 | Schwarz criterion | | 68.92789 |
| Deviance | 9.892523 | Scale | | 0.402495 |
| Rn-squared statistic | 9.360193 | Prob(Rn-squared stat.) | | 0.002217 |

The coefficient values of the variables (the constant (C) and independent variable $TI_{alternative}$) are statistically significant. Significance values are 0.0000 and 0.0022, respectively ($p<0.05$ and $p<0.01$)). The explained variance ($R^2$) is 0.123 (0.123944). In other words, the ratio of the independent variable to explain the dependent variable is about 12.3 percent. The equation is formulated as follows. Terrorist attacks are affected by $TI_{alternative}$

$$\text{FDI as percentage of GDP}=0.520989+0.010401TI_{alternative} \quad \text{(Equation 7)}$$

According to this equation, for example, when the terrorist attack increases from one to ten, the ratio of foreign direct investment in gross domestic product increases by approximately 1.18 times from 0.53139 to 0.624999 and when the terrorist attack increases from one to five hundred, the ratio of foreign direct investment in gross domestic product increases by approximately 10.77 times from 0.53139 to 5.721489. It should be reminded that all these results are with the expected values according to the formulas.

Table 13 presents the results as a whole in terms of the hypotheses. The results show that there is a bidirectional relationship between TI and FDI in the Greece example – There is causality between TI and FDI. However, the causality from FDI to TI with complete data is significant at the ten percent level; hence meaning causality tendency. This causality is even more evident when FDI is considered as a percentage of GDP.

Table 13
Robust Regression Results for Greece

| | Result | | |
|---|---|---|---|
| Null Hypothesis | $H_o$ | $H_1$ | |
| TI is not the cause of FDI | x | √ | |
| $TI_{alternative}$ is not the cause of FDI | x | √ | |
| FDI is not the cause of TI | √ | x | |
| FDI is not the cause of $TI_{alternative}$ | x | √* | |
| TI is not the cause of FDI as percentage of GDP | x | | √ |
| $TI_{alternative}$ is not the cause of FDI as percentage ofGDP | x | √ | |
| FDI as percentage of GDP is not the cause of TI | x | | √ |
| FDI as percentage of GDP is not the cause of $TI_{alternative}$ | x | | √ |

* This result is significant at the 0.10 significance level.[18]

Considering that there is a literature that contains results that show that terrorism has no effect on foreign direct investments,[19] it is thought that this effect, which emerged in the case of Greece in this study, may be due to the weight of leftist terrorist organizations. Data [20] show that anti-capitalist terrorist organizations such as Anarchist Night Raid Teams (14 incidents), Anarchists (65 incidents and suspected 4 incidents), November 17 Revolutionary Organization (88 incidents and suspected 25 incidents), and Revolutionary People's Struggle (ELA-77 incidents and suspected 5 incidents)) are predominantly and effective. Figure 5, showing the number of attacks by target types, confirms this result. As can be seen from the Figure 5, business-oriented attacks are significantly higher.[21]

[18] It should be repeated that this level means *causality tendency* for 0.05≤p=0.0967<0.10. For detail, see Akbulut (2022, 12).

[19] In this context, the studies of Li (2006), Radić (2018), and Ak and Inal (2017) can be given as examples. Using the Panel Data Analysis method for the years 1976-1996 in his study, Li concludes that terrorism does not have a statistically significant effect on foreign direct investments. For detail, see Quan Li, "Political Violence and Foreign Direct Investment", *Regional Economic Integration*, (ed.) Michele Fratianni, Bingley, Emerald Group Publishing Limited, 2006, pp. 225-249. Radic reaches a similar conclusion in the evaluation made by Dynamic Panel Data Analysis based on the data of 50 countries for the years 2000-2016. However, this study of Radic covers foreign direct investments in tourism. For details, see Maja Nikšić Radić, "Terrorism as a Determinant of Attracting FDI in Tourism: Panel Analysis", *Sustainability*, Volume 10, Number 4553, 2018, pp. 1-17. The other work mentioned above belongs to Ak and Inal. Using the Hatemi-J asymmetric causality method, based on the data between 1980 and 2015, they concluded that there is no causal relationship between terrorism and foreign direct investment in the case of Türkiye. For detail, see "Terrorism and Foreign Direct Investment in Türkiye: Hidden Cointegration and Asymmetric Causality Relationship." On the other hand, for an article that includes examples of studies demonstrating a negative causality between terrorism and foreign direct investment, see Yılmaz Onur Ari and Bello Ibrahim, "The Impact of Terrorism on Foreign Direct Investment: The Case of Turkey", *Third Sector Social Economic Review*, Volume56, Number 3, 2021, pp. 1781-1797.

[20] Data have been extracted from the Global Terrorism Database as of October 25, 2023. For details, see University of Maryland, 'Terrorist Incidents by Country: (Greece)'.

[21] Ten of the business-oriented attacks also involve other targets such as police, government and NGOs. Here it is included in the business-oriented attack group. Seven of the attacks related to government (general) also include other targets such as police, private citizens & property. Here, it is included in the government (general) group. Similarly, six of the attacks against the police group, four of the attacks against the private citizens & property group, seven of the attacks against the government (diplomacy) group, and two of the attacks against the journalist & media group also include one or more of the other target groups.

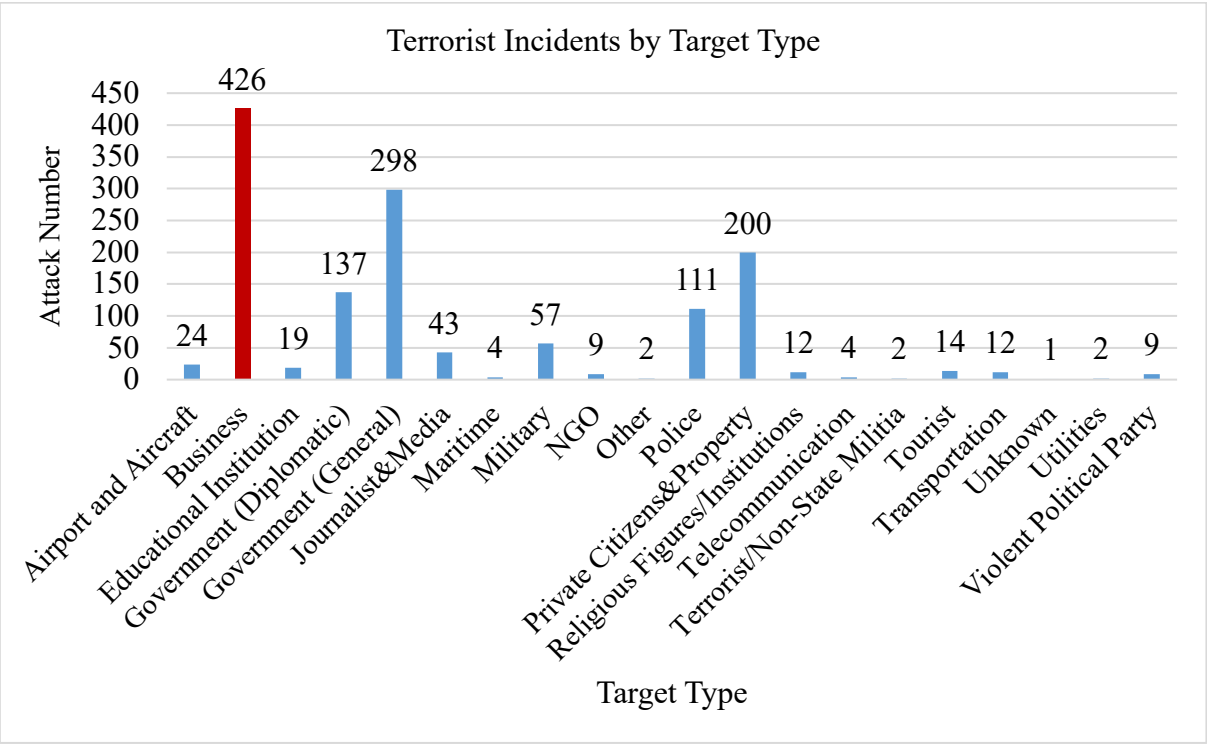



Figure 5. Terrorist Incidents by Target Type in Greece

## Conclusion

In Greece, TI and FDI explain the relationship at the level of 17.89 percent, and this relationship is statistically significant. TI and FDI as a percentage of GDP explain the relationship at the level of 22.27 percent, and this relationship is also statistically significant.[22]

Because the variables do not meet the normal distribution requirement, they are unsuitable for normal (conventional) regression analysis. For this reason, the time series of the variables are evaluated using advanced regression analysis methods, and the status of the data is suitable for robust regression analysis.[23]

Robust regression analysis shows a bidirectional causality relationship between TI and FDI. This relationship is statistically valid for independent variables and constant (C) from TI to FDI direction. Therefore, there is a statistically significant causality relationship from TI to FDI. If it is from FDI to TI, *causality tendency* is valid. However, the causality trend shows that terrorist attacks increase foreign direct investment in the short run. It seems that terrorist attacks in Greece have a characteristic reaction to foreign direct investment, and vice versa. However, contrary to expectations, this reaction is not negative but positive; foreign direct investment reacts as an increase in the short term. This result can be explained by equations such as the economics discipline's consumption function or understood with international political economy approaches, if not a false causality.

[22] In the regression analysis, evaluations have been made as a result of both missing data and the completion of the missing data with the arithmetic mean. In contrast a correlation analysis has been made on the missing data. However, when the missing data is completed with the alternative mean, close results are obtained in the correlation analysis that does not affect the result. In this case, the results are as follows. The correlation coefficient for the first hypothesis is 0.418 (41.8 percent), the explained variance is 0.174724 (17.4 percent), the significance value is 0.002, the correlation coefficient for the second hypothesis is 0.473 (47.3 percent), the explained variance is 0.223729 (22.3 percent), and the significance value is 0.000.

[23] The following sources have been also used for statistical concepts in this study. Munevver Turanli and Selahattin Guris, *Temel Istatistik*, Der Yayinlari, Istanbul, 2018. Selahattin Guris, Burak Guris and Ebru Caglayan Akan, *Eviews ile Temel Ekonometri*, Der Yayinlari, Istanbul, 2017.

The fact that the effect is in the short term may or especially relate to the consumption function.[24] In terms of political economy, it is also unreasonable for Greece, a member of North Atlantic Treaty Organization (NATO) and the European Union, to be protected against attacks by far-left terrorist organizations.

When looking at the profile of terrorist organizations that carry out attacks, it is seen that leftist organizations with anti-capitalist discourse predominate.[25] Greece's example shows that the profile of the terrorist organization is important in assessing the impact of foreign direct investments on terrorism.[26]

Finally, it is possible to say that this study improves one's knowledge in the case of Greece that the variables (terrorist incident and foreign direct investment) have a potential regarding bidirectional relationship with each other. Considering the terrorism literature, the example of Greece reveals that foreign direct investment can possess an effect on predominantly left-wing terrorist organizations. However, for such a result to progress towards theorizing, going back over or re-examining the experiences of other countries by taking the parameter of terrorist organization profile into account will contribute to developing one's horizon.[27]

[24] For the Pakistani example showing that terrorist attacks increase private consumption in the short term, see Syed Hasanah Shah, Hafsa Hasnat and Mohsin Hasnain Ahmad, "The Effects of the Human Cost of Terror on National Income, Private Consumption and Investment in Pakistan: An Empirical Analysis", South Asia Economic Journal 17(2), 2016, pp. 216-235.

[25] In this sense, Greece suffers from Left Wing Fundamentalism when considering the foreign direct investment parameter. For Fundamentalism typology and Left Wing Fundamentalism, see Serkan Yenal, "Radikallesme-Koktencilik Baglaminda Teror ve Terorizm," *Siyasal Siddet ve Radikallesme Baglamında Teror Orgutleri*, (eds.) Hasar Acar and Serkan Yenal, Ankara, Nobel Yayınevi, pp. 21-43. On the other hand, in terms of targeting capitalism, the targets of both the new left wave (from the 1960s to 1980s) and the next generation terrorism (September 11 attacks and after) are common. See again Serkan Yenal and Memduh Beğenirbas, "Evaluation of Terrorism in Latin American Countries with Changing Terrorism Concept," *Science Journal of Turkish Military Academy*, Volume 29, Number 2, December 2019, pp. 203-227.

[26] A similar result holds for Peru. For the Peru case, see Mahir Terzi, "Terrorist Incidents and Foreign Direct Investment: Results Uncovered by Relational Models in the Cases of Colombia and Peru," *Latin American Economic Review*, Volume 3, 2024, 1-27.

[27] Osgood and Simonelli come to the following conclusions through the US-based multinational companies. Companies are less susceptible to terrorism if host markets have site-specific assets that are a good match for the needs of foreign companies. If the companies' inputs are compatible with the host country (unless other suitable matches exist, i.e., there are no alternative markets for the input), if production is based on exclusive licenses on assets, and if companies make heavy use of fixed capital expenditures for mineral leasing and exploration, then FDI is less sensitive to terrorism. In other words, if the foreign investor has monopoly opportunities depending on the relevant raw material for production, the decision to invest is not easily affected by terrorism. For details, see Iain Osgood and Corina Simonelli, "Nowhere to Go: FDI, Terror, and Market-Specific Assets", Journal of Conflict Resolution, Volume 64, No 9, 2020, pp. 1-28.

## Appendices

Appendix 1
Normality Test Results for Hypothesis 1

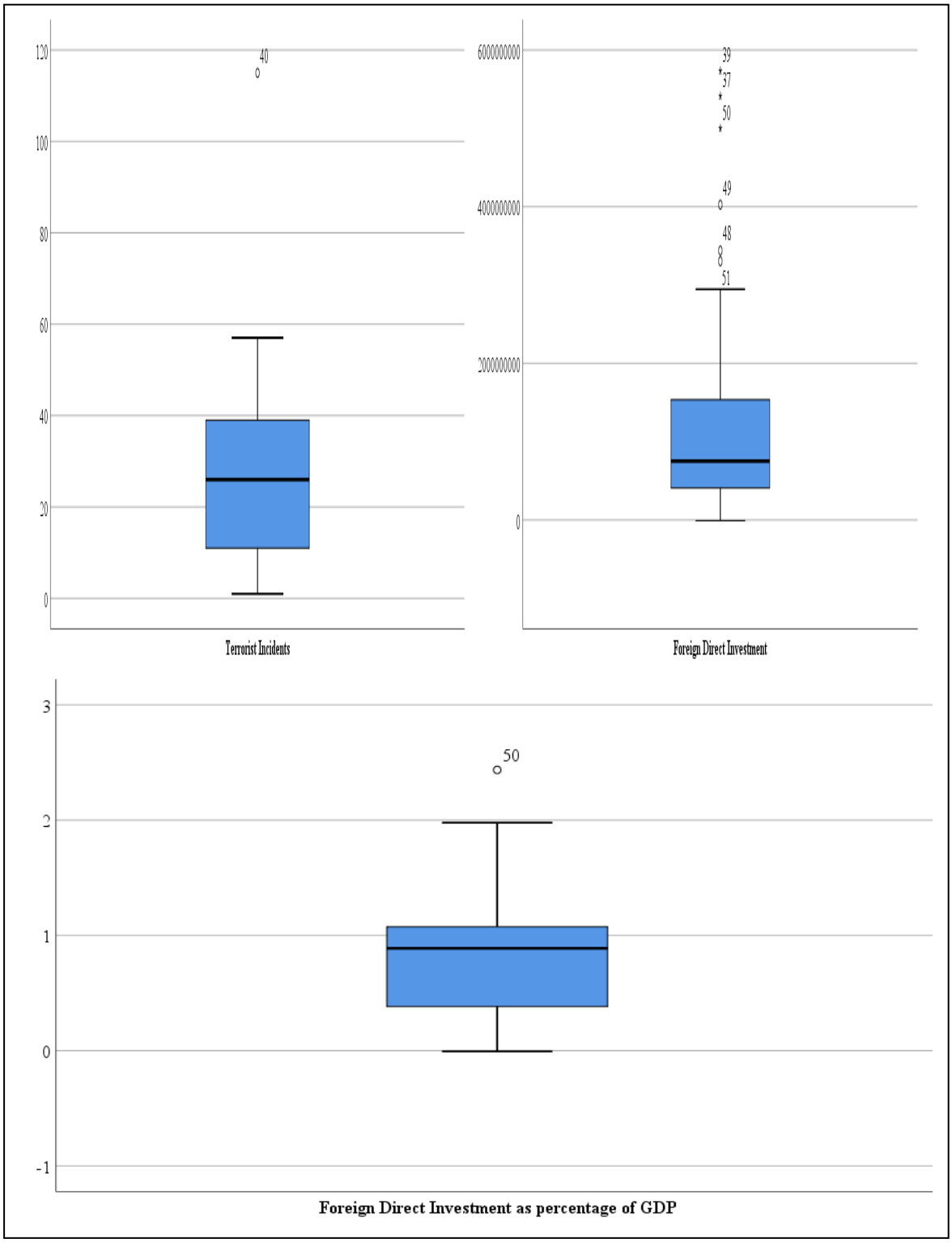
| Evaluation Parameters | Values of Terrorist Incident | | Values of Foreign Direct Investment | | Reference Value | Result | |
|---|---|---|---|---|---|---|---|
| | Skewness | Kurtosis | Skewness | Kurtosis | | Terror Incidents | Foreign Direct Investment |
| Investigation of Skewness/Kurtosis Values | 1.621 | 5.252 | 1.651 | 2.196 | between -1.50 and +1.50 | Non-Normal Distribution | Non-Normal Distribution |
| Dividing Skewness /Kurtosis Values by Standard Error | 4.810 (1.621/0.337) | 7.933 (5.252/0.662) | 4.958 (1.651/0.333) | 3.347 (2.196/0.656) | between -1.96 and +1.96 | Non-Normal Distribution | Non-Normal Distribution |
| The Absolute Values of the Skewness Coefficients | 4.810 | - | 4.958 | - | Skewness Coefficients Less than Twice the Standard Errors | Non-Normal Distribution | Non-Normal Distribution |
| Control of Extreme Values/ Z Score | One extreme Z value (Year 2019) | | One extreme Z value (Year 2008) | | between -3 and +3 | Non-Normal Distribution | Non-Normal Distribution |
| **Test Result to be Applied** | | | | | | **Spearman Correlation Test** | |

Appendix 2
Normality Test Results for Hypothesis 2

| **Evaluation Parameters** | **Values of Terrorist Incident** | | **Values of Foreign Direct Investment as percentage of GDP** | | **Reference Value** | **Result** | |
|---|---|---|---|---|---|---|---|
| | **Skewness** | **Kurtosis** | **Skewness** | **Kurtosis** | | **Terror Incidents** | **FDI (as percentage of GDP)** |
| Investigation of Skewness/Kurtosis Values | 1.621 | 5.252 | 0.556 | 0.520 | between -1.50 and +1.50 | Non-Normal Distribution | Normal Distribution |
| Dividing Skewness /Kurtosis Values by Standard Error | 4.810 (1.621/0.337) | 7.933 (5.252/0.662) | 1.669 (0.556/0.333) | 0.793 (0.520/0.656) | between -1.96 and +1.96 | Non-Normal Distribution | Normal Distribution |
| The Absolute Values of the Skewness Coefficients | 4.810 | - | 1.669 | - | Skewness Coefficients Less than Twice the Standard Errors | Non-Normal Distribution | Non-Normal Distribution |
| Control of Extreme Values/ Z Score | One extreme Z value (Year 2019) | | No extreme Z value | | between -3 and +3 | Non-Normal Distribution | Normal Distribution |
| **Test Result to be Applied** | | | | | | **Spearman Correlation Test** | |

Appendix 3

Observed Values for Terrorist Incidents



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## Genişletilmiş Özet

### Amaç

Terörizmin doğrudan yabancı yatırımı etkileyip etkilemediğini değerlendirirken, sonuçlar teorileştirmeye izin vermemektedir. Bununla birlikte herhangi bir ülkenin deneyiminin zaman içinde değişip değişmediği merak konusu olabilir. Bu anlamda belirli aralıklarla yapılan ölçümler (istatistiksel değerlendirmeler) bile daha önce ulaşılan bir sonucun doğrulanıp doğrulanamayacağı açısından önemlidir. Ortak nedenlerin tipik bir sonuca yol açıp açmadığını araştırmak için bireysel ülke deneyimleri daha yakından analiz edilebilir. Böylece terör tipolojisinin (sağ veya sol örgüt, ulusal veya uluslararası örgüt vb.) doğrudan yabancı yatırımları etkileyip etkilemediğine ilişkin çıkarımlar yapmak mümkün olabilir.

Bu çalışma, Yunanistan'daki terör saldırılarının doğrudan yabancı yatırımları etkileyip etkilemediğini değerlendirmeyi ve bu çerçevede literatüre katkıda bulunmayı amaçlamaktadır. Peşinen söylemek gerekirse araştırma bulguları, terörist örgüt profilinin bir nüans yarattığını ortaya koymakta ve bu nüans bulguların değerlendirilmesi aşamasında fark edilmiştir.

### Tasarım ve Yöntem:

Araştırmaya konu olan değişkenler terörist saldırı, doğrudan yabancı yatırım ve gayrisafi yurt içi hasılanın yüzdesi olarak doğrudan yabancı yatırım olarak üç tanedir. Araştırmanın değişkenlerine ilişkin veriler, 1970-2020 yılları arasındaki verilere dayanmaktadır. İlk değişkene ait veriler Küresel Terörizm Veri Tabanına dayanmaktadır (Global Terrorism Database-GTD). Diğer değişkenlere ait veriler ise Dünya Bankası'na dayanmaktadır. Uygun analizin ne olduğunu belirlemek için öncelikle verilerin normal dağılıma sahip olup olmadığı test edilmektedir. Bu bağlamda verilerin hangi korelasyon ve regresyon analizine uygun olduğu belirlenecektir.

Verilerin normal dağılım göstermediği tespit edildiğinden korelasyon analizi olarak Sperman Sıralı Korelasyon testi yapılmıştır. Bu amaçla iki korelasyon hipotezi test edilmektedir. Hipotez 1, yıllık terör olayı sayısının doğrudan yabancı yatırımları etkilediğini belirtmektedir ($H1_o$:r=0 ve $H1_1$:r≠0). Hipotez 2 ise yıllık terör olaylarının sayısının Yunanistan'ın gayri safi yurt içi hasılasında doğrudan yabancı yatırımın payını etkilediğini göstermektedir ($H2_o$:r=0 ve $H2_1$:r≠0). Değişkenler arasında nedensel bir ilişkisi olup olmadığını belirlemek için de regresyon analizi yapılmaktadır.

Geleneksel regresyon analizinde de verilerin normal dağılım sergilemesi gerekmektedir. Ancak uç değerleri dikkate alan ileri regresyon analizleri bu engeli aşmaya imkân verdiğinden burada dayanıklı regresyon analizi yapılmıştır. M-tahmini bağımlı değişken uç değerlerini dikkate alır (Huber, 1973, s.799-821). Öte yandan, S-tahmini (Rousseauw & Yohai, 1984, s.256-272) bağımsız değişken (regresör) uç değerlerini dikkate alır. MM-tahmini (Yohai, 1987, s.642-656) ise hem bağımlı hem de bağımsız değişkenler için uç değerleri hesaba kattığı için (EViews, 2023) bu çalışma için uygun bir regresyon analizidir.

### Bulgular

Verileri analiz etmeden ve temellendirmeden önce, her değişkenin normal dağılıma sahip olup olmadığını bilmek önemlidir. Tablo 3 ve 4 normallik testlerinin sonuçlarını göstermektedir. Tablo 3'teki değişkenlere ilişkin veriler değişkenlerin normal dağılıma sahip olmadığını göstermektedir. Tablo 3'teki verilerden görüldüğü gibi değişkenlere ait veriler normallik testi için gerekli referans aralıkları içerisinde değildir. Yine Tablo 4'teki değişkenler bir bütün olarak ele alındığında normal dağılım koşulunu karşılamamaktadır. Şekil 4 ayrıca uç gözlemleri işaretleyerek bu sonuçları doğrulamaktadır. Şekil 4'teki 40 numaralı veri (2019 yılı) terör olaylarının normal dağılımını bozmaktadır. Benzer şekilde 37 (2016 yılı), 39 (2008 yılı), 48 (2017 yılı), 49 (2018

yılı), 50 (2019 yılı) ve 51 (2020 yılı) numaralı veriler de normal dağılımı bozmaktadır. Kısaca doğrudan yabancı yatırımın normal bir dağılım göstermediği ve uç değerlere sahip olduğu bu verilerden anlaşılmaktadır.

Korelasyon analizi terörist saldırısı ile doğrudan yabancı yatırımlar arasında orta düzeyde bir ilişki olduğunu göstermektedir. Değişkenlerin birbirleri üzerindeki ilişkiyi açıklama oranları yaklaşık yüzde 18'dir (% 17,89). Yine korelasyon analizi, terörist saldırı ile gayrisafi yurtiçi hasılanın yüzdesi olarak doğrudan yabancı yatırım değişkeni arasında orta düzeyde ama biraz daha yüksek bir ilişki olduğunu göstermektedir ve değişkenlerin birbirleri üzerindeki ilişkiyi açıklama oranları yaklaşık yüzde 22'dir (% 22, 23).

Dayanıklı regresyon analizi, terör saldırısı (TI) ve doğrudan yabancı yatırım (FDI) arasında çift yönlü bir nedensellik ilişkisi göstermektedir. Bu ilişki bağımsız değişkenler ve sabit (C) için TI'dan FDI yönüne istatistiksel olarak geçerlidir. Dolayısıyla TI'dan FDI'ya istatistiksel olarak anlamlı bir nedensellik ilişkisi vardır. FDI'dan TI'ya doğruysa *nedensellik eğilimi* söz konusudur. Ancak nedensellik eğilimi, terörist saldırıların kısa vadede doğrudan yabancı yatırımı artırdığını göstermektedir. Yunanistan'daki terör saldırılarının yabancı doğrudan yatırıma karakteristik bir tepkisi olduğu ve bunun tersinin de geçerli olduğu görülmektedir. Ancak beklentilerin aksine bu tepki olumsuz değil olumludur; yabancı doğrudan yatırım kısa vadede artış olarak tepki vermektedir. Bu sonuç ekonomi disiplininin tüketim fonksiyonu gibi denklemlerle açıklanabilir veya uluslararası politik ekonomi yaklaşımlarıyla anlaşılabilir. Bu etkinin kısa vadede olması özellikle tüketim fonksiyonuna işaret edebilir- Literatürde Pakistan örneği bağlamında da benzer sonuçlarla karşılaşılmaktadır.

Saldırıları gerçekleştiren terör örgütlerinin profiline bakıldığında, anti-kapitalist söylemli sol örgütlerin baskın olduğu görülmektedir. Yunanistan örneği, terör örgütünün profilinin yabancı doğrudan yatırımların terörizm üzerindeki etkisini değerlendirmede önemli olduğunu göstermektedir.

**Sınırlılıklar**

Araştırmanın örneklemini 1970-2020 yılları arasında gerçekleşen 1.386 terör olayı oluşturmaktadır. Veri tabanında düzenli olarak güncellemeler yapıldığından 25 Ekim 2023 tarihi itibarıyla verilerin dağılımı dikkate alınmaktadır. Terörist saldırılarla ilgili zaman serisinde eksik veri bulunmaktadır. Bu eksik veri aritmetik ortalama ile tamamlanmıştır. Ancak analiz her hâlükârda hem eksik veri ile hem de tamamlanmış veri ile yapılmaktadır.

Burada üzerinde durulması gereken önemli bir konu ise terörist saldırı tanımının kendisidir. GTD' deki saldırılar silahlı saldırı, silahsız saldırı, suikast, bombalama/patlatma, uçak kaçırma, rehin alma (barikat), rehin alma (adam kaçırma) ve tesis/altyapı saldırılarını içerir. GTD kayıtlarında, rezerv kayıt hariç, üç kriter vardır. Veri tabanına tabi tutulan kayıtlı veriler en az iki kriteri, özellikle Kriter 1 ve Kriter 2'yi karşılamalıdır. Kriter 1, eylemin politik, ekonomik, dini veya sosyal amaçlar için tasarlandığını ifade eder. Ekonomik hedefler için tek başına çıkar elde etmek yeterli değildir. Sistemik ekonomik değişimler hedeflenmelidir. Kriter 2, ciddi kanıtların kurbandan ziyade daha geniş bir kitleye zorlama, sindirme veya başka bir mesaj göndermeyi amaçladığını belirtmektedir. Hareket eden her bireyin bu amacın bilincinde olup olmadığı önemli değildir. Kritik konu, eylemi bir bütün olarak hesaba katmaktır. Amaçlılık ölçütü için saldırıların arkasındaki tasarımcıların veya karar vericilerin zorlama, sindirme veya kamuya açıklama amaçlı olması yeterlidir. Kriter 3, eylemin meşru savaş faaliyetleri koşulunun dışında olması gerektiği anlamına gelir. Sivil veya savaş dışı kişiler kasıtlı olarak hedef alınırsa, Kriter 3 karşılanmış olur (University of Maryland, 2023).

Rezerv kayıt ise GTD uzmanları arasında bir saldırının terörist saldırı olup olmadığı konusunda şüphe varsa, o zaman böyle bir kodlama yapılmasını ifade eder. GTD analistleri, dört olası alternatif tanımdan birine göre bu tür belirsizliği kodlar. Bunlar; 1) İsyan/Gerilla Hareketi, 2) İç Çatışma Eylemi, 3) Toplu Cinayet veya 4) Tamamen Suç Eylemi.

**Öneriler**

Terörizm literatürü göz önüne alındığında, Yunanistan örneği yabancı doğrudan yatırımın ağırlıklı olarak aşırı sol görüşlü terör örgütleri üzerinde bir etkiye sahip olabileceğini ortaya koymaktadır. Ancak böyle bir sonucun teorileştirmeye doğru ilerlemesi için terör örgütü profili parametresini de hesaba katarak diğer ülkelerin deneyimlerine geri dönmek veya yeniden incelemek ufkumuzu geliştirmeye katkı sağlayacaktır. Mevcut literatür terör saldırılarının doğrudan yabancı yatırımlar üzerinde teorileştirilebilecek bir temele sahip olmadığını göstermekle birlikte terörist örgüt profili dikkate alındığında terörist saldırı, terörist örgüt profili ve doğrudan yabancı yatırım arasındaki ilişkinin teorik ve genelleştirilebilir bir mahiyette olup olmadığını araştırmak öğretici olacaktır.

**Özgün Değer**

Bu çalışmanın sonuçları, terörizm tipolojisinin doğrudan yabancı yatırımları etkileyip etkilemediği konusunda diğer ülkelerin deneyimleri ile yeni teorik yaklaşımların ortaya çıkmasını sağlayabilecektir. Diğer bir ifadeyle bu çalışmanın sonuçları, terörizm tipolojisinin (özellikle aşırı sol eğilimli) doğrudan yabancı yatırımlar üzerinde bir etkisinin olup olmadığı ve şayet varsa bu ilişkinin teorileriştirilip teorileştirilemeyeceği konusunda bir veri sunmaktadır.

**Araştırmacı Katkısı:** Mahir TERZİ (%70), Serkan YENAL (%30).