A SPATIAL ANALYSIS OF TÜRKİYE'S CROSS-BORDER COUNTERTERRORISM OPERATIONS ON IRAQ'S STABILITY: 2004-2023[1]

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ABSTRACT

The main purpose of this study is to examine the spatial impact of Türkiye's cross-border operations on Iraq, particularly focusing on their potential to destabilize the northern region using Geographical Information Systems (GIS). Türkiye's operations are often criticized in both political discourse and academic literature, with the argument that they disrupt the stability of Iraq's northern provinces, which are considered to be among the most stable parts of the country. To investigate this claim, this study employs Global Moran's I* and Getis-Ord General G analyses to assess the spatial distribution of attack intensity across Iraqi provinces. The time period considered is the post-occupation era. To further delve into the dynamics of violence, the analysis will be divided into three sub-periods based on significant changes in attack patterns in general: 2004-2012, 2013-2017, and 2018-2023. Additionally, to ensure the reliability of the results, the analyses will be conducted both with and without data on Türkiye's involvement. To enhance the robustness of the findings, comparative analyses will be conducted both with and without incorporating data on Türkiye's military interventions. The results of this study will provide valuable insights into the complex relationship between cross-border operations and regional stability in the Middle East. The study concluded that Türkiye's operations did not statistically affect the spatial distribution of violence in North of Iraq.

Keywords: *Spatial analysis, operations of Türkiye, Geographical Information Systems*
JEL Codes: *C21, D74*
Scope: *International relations*
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[1] The study has been officially stated to follow the ethical standards required for its specific field of research.

TÜRKİYE'NİN SINIRÖTESİ TERÖR KARŞITI OPERASYONLARININ IRAK'IN İSTİKRARINA ETKİSİNİN MEKANSAL ANALİZİ: 2004-2023

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ÖZ | Bu çalışmanın temel amacı, Türkiye'nin Irak'a yönelik sınır ötesi operasyonlarının, özellikle kuzey bölgesini istikrarsızlaştırma potansiyeli üzerindeki mekansal etkisini Coğrafi Bilgi Sistemleri (CBS) kullanarak incelemektir. Türkiye'nin operasyonları, hem siyasi söylemde hem de akademik literatürde sıklıkla eleştirilmekte ve Irak'ın en istikrarlı bölgeleri olarak kabul edilen kuzey illerinin istikrarını bozduğu iddia edilmektedir. Bu iddiayı araştırmak için, çalışma, Irak illerindeki saldırı yoğunluğunun mekânsal dağılımını değerlendirmek için Global Moran's I* ve Getis-Ord Genel G analizlerini kullanmaktadır. İncelenen dönem, işgal sonrası dönemdir. Şiddet dinamiklerini daha derinlemesine incelemek için, analizler genel olarak saldırı modellerindeki önemli değişikliklere dayanarak üç alt döneme ayrılacaktır: 2004-2012, 2013-2017 ve 2018-2023. Ayrıca, sonuçların güvenilirliğini sağlamak için analizler, Türkiye'nin müdahil olduğu verilerle ve olmadan gerçekleştirilecektir. Bulguların sağlamlığını artırmak için, karşılaştırmalı analizler, Türkiye'nin askeri müdahaleleri hakkındaki veriler dâhil edilerek ve edilmeden gerçekleştirilecektir. Bu çalışmanın sonuçları, Ortadoğu'da sınır ötesi operasyonlar ile bölgesel istikrar arasındaki karmaşık ilişki hakkında değerli bilgiler sağlayacaktır. Araştırmada Türkiye'nin operasyonlarının Kuzey Irak'taki şiddetin mekansal dağılımını istatistiksel olarak etkilemediği sonucu ortaya çıkmıştır.

Anahtar Kelimeler: *Mekânsal analiz, Türkiye'nin operasyonları, Coğrafi Bilgi Sistemleri*
JEL Kodları: *C21, D74*
Alan: *Uluslararası ilişkiler*
Türü: *Araştırma*

1. INTRODUCTION

Since the 2003 U.S. invasion of Iraq, the country has experienced both domestic and international conflicts. While Saddam Hussein's Ba'ath regime maintained relative domestic stability through the use of force, the U.S. invasion exposed Iraq's underlying fragility, rooted in its diverse and cosmopolitan structure. The country is composed of three major groups: Shia, Sunni Arabs, and Kurds, along with other minorities such as Turkmens and Assyrians. Despite the Ba'ath regime's authoritarian rule, which suppressed ethnic conflicts for four decades, the U.S. invasion's liberal interventionist motives failed to restore liberal institutions and instead created a power vacuum that fueled long-lasting conflicts. Following the U.S. invasion, conflicts spread throughout Iraq, exacerbated by the Syrian Civil War and the aggression of DAESH. Ultimately, Iraq suffered from state failure.

The state failure in Iraq either empowered or gave rise to several non-state actors. Hafez (2006) categorizes the suicide attackers based on their objectives (system reintegration or system collapse) and ideologies (Islamists or Nationalists), identifying seven major active groups targeting the post-invasion political structure. Since Hafez's work focuses on suicide bombings, Sunni Arab groups naturally became the primary subject of study. However, considering other groups or terrorist organizations, such as the PKK in the north of Iraq, the number of actors involved in the region's conflicts increases. Therefore, following the U.S. invasion and subsequent state failure, conflicts in Iraq surged dramatically after 2003. For instance, while there were only 6 violent events in Iraq in 2002, the number skyrocketed to 106 in 2003 and 344 in 2004 (Davies et al., 2024).

The magnitude and scope of violent attacks in Iraq elevated the country to a critical research area for conflict studies. Indeed, Iraq has become an important case study within the field of conflict studies. Since the invasion, conflict and post-conflict issues have been prominent in Iraq. These include the failed American invasion (Godfroy & Collins, 2019), which created a security vacuum and necessitated the establishment of new security forces for the post-invasion regime (Wilcke, 2006). Related to this, both political integration (Ucko, 2008) and descriptions of insurgencies (Hughes, 2010), and counterinsurgency (Hoffman, 2006) have been extensively examined in the literature. Regarding quantitative analyses, significant contributions have been made to the literature examining different times and spaces. While in the early years of the Iraq War, attention had been on the US’s strategic decision such as Mead’s (2005) game theoretical approach to the war, it has shifted to terrorist and suicide attacks after the invasion. The quantitative analyses of Ayers (2008) and Seifert & McCaulet

(2014) are the outstanding studies on suicide bombings in Iraq. Additionally, several studies have tested the power law distribution of violent attacks in both the whole of Iraq (Amara & McNab, 2010) and specifically in Diyala Province (Cioffi-Revilla & Romero, 2009). In this regard, the existing literature on quantitative analyses primarily focuses on attacks by non-state actors. The effects of state involvement (i.e., U.S. involvement) or counter-terrorism operations (i.e., Türkiye's operations) are not sufficiently explored quantitatively. Finally, the prolonged and pervasive terrorist attacks provide valuable data for scholars studying spatial analysis (Medina et al., 2011; Siebeneck et al., 2009). Both Medina et al.'s and Siebeneck et al.'s studies conclude that terrorist attacks are correlated with population density and special days. Furthermore, Baghdad, East of Iraq, and North of Iraq are identified as the regions with the highest intensity of attacks. These valuable studies contribute to our understanding of the spatial dependence of violent events throughout Iraq. Due to their focus on general tendencies, however, the marginal contribution of individual actors cannot be discerned.

Türkiye has also been involved in the northern part of the country due to the increased attacks by the terrorist Kurdistan Workers' Party (PKK). Although the number of attacks against Türkiye dramatically decreased after 1994 and reached near-cease levels in 2002, they revived after the US invasion and escalated again after 2010 (START, 2022). Despite shared counter-terrorism interests, a significant gap existed between the U.S. and Türkiye regarding north of Iraq (Müftüler-Bac, 2006, p. 63). While the US rhetorically supported Türkiye's counter-terrorism operations, it hesitated to provide active aid to its NATO ally in the region. This reluctance stemmed, in part, from the close relationship between the U.S. and Iraqi Kurds, who were valued partners in the war against Saddam Hussein (Altunışık, 2006, p. 190; Kardaş, 2021, p. 137; Gunter, 2015, p. 108). Ironically, north of Iraq is often cited as the most stable region within the country (Aspell, 2005; Glavin, 2015; Hitchens, 2007). Despite this, Türkiye has undertaken several military interventions in Iraq, particularly since 2008, in response to escalating border tensions and attacks on border outposts. However, these interventions have drawn criticism from academic, public, and political circles, who perceive them as destabilizing factors (Larrabee, 2010, pp. 16–17; Mohammed, 2007). As a result, only Türkiye's anti-Daesh operations have been supported by both the US and Iraqi governments.

In contrast to criticisms, Turkish academia asserts that Türkiye's cross-border operations to Iraq are based on international law under Positive Obligations (Akutay & Ateş, 2013). Additionally, they contribute to regional security due to their counter terrorism nature (Şahin, 2023). Unlike the US

claimant that the region is the most stable part of Iraq, from Türkiye's perspective the northern region of Iraq became a safe haven for the PKK following the US invasion, making the area far from an island of stability. Therefore, Türkiye's operations, which are in conceptualized as Rapid Decisive Operations (Yeşiltaş, 2020) do not harm the non-existent stability. According to Sadri Alibabalu, (2022, p. 156) the so-called stability in the north of Iraq was not due to the state capacity but rather to regional government's reluctance to initiate action against the PKK and affiliated groups.

As the preceding discussion illustrates, scholarly discourse regarding Türkiye's cross-border operations into Iraq is characterized by two divergent viewpoints. On the one hand, Türkiye's interventions are qualitatively posited as destabilizing forces in north of Iraq. Conversely, it is argued that the region is far from an 'island of stability,' thereby rationalizing the operations as integral to the war on terror. However, both assertions lack robust empirical support within the existing literature. Therefore, this article endeavors to examine Türkiye's military operations within Iraq through the application of spatial analytical techniques, specifically to assess whether north of Iraq constitutes the most stable region of the country and whether Türkiye's engagement has influenced this condition. Thus, the main research question of the article is: How do Türkiye's military operations affect the stability of north of Iraq. The research question will be inquired by the hypotheses that are H_0: *There is no clustering in violent attacks in Iraq* in each time periods. The analysis is limited by the test of spatial autocorrelation instead of spatial dependence, because the main aim is to understand only Türkiye's marginal effect on stability. In this regard, having put the data and method in the second section, the third section of the paper will provide a descriptive overview of Türkiye's military operations in Iraq and outline the primary objectives of these operations. This will be followed by the spatiotemporal analysis of organized violence in Iraq after the US invasion.

2. THEORETICAL FRAMEWORK

Cross-border military operations frequently expose the tension inherent in international relations. Although state sovereignty is widely recognized as a core principle, its infringement occurs regularly. While aggression has been codified as an international crime for close to a century, the parameters of 'just war' continue to be a subject of debate. Contemporary literature identifies three primary justifications for cross-border military operations: liberal interventionism, the Responsibility to Protect (R2P), and counter-terrorism efforts against non-state actors.

Liberal interventionism was used as a democracy promotion tool espacially after 9/11. The doctrine basicaly argues that collective military intervention is justified in cases of severe human rights violations by a state or within an internal conflict (Lipsey, 2016, p. 416). Tony Blair prominently used this rationale in the period preceding the Iraq War. The period following the Cold War was characterized by a perception of the triumph of liberal values, with an expectation of the expansion of the liberal international order. Consequently, resistance to this perceived order was often framed as necessitating transformation, potentially through intervention. This contributed to a heightened prevalence of interventionist rhetoric and action following 9/11. However, liberal interventionism faces significant criticism, including accusations of bias and of serving to reinforce a US-favorable liberal international system. Critiques also point to the frequent disparity between stated goals of democracy promotion and the actual outcomes of interventions (Baciu et al., 2024).

The second justification for cross-border operations is the emerging Responsibility to Protect (R2P) doctrine. The doctrine was adopted by the United Nations in 2005. Accordingly, when a state fails to protect its population from genocide, war crimes, ethnic cleansing, and crimes against humanity, the international community, through the Security Council, has a responsibility to take collective action. This may include the use of diplomatic, humanitarian, and other peaceful means, and, as a last resort, the use of force under Chapter VII of the UN Charter. However, scholarly inquiry and a vast body of literature on the Responsibility to Protect often center on its implementation failures (Gözen Ercan, 2022, p. 291). Consequently, R2P's practical application in justifying cross-border operations and political violence is limited. It primarily functions as a normative principle rather than a consistent explanatory factor.

Finally, counter-terrorism efforts against non-state actors represent not only the most frequent form of cross-border operation but also a significant explanatory factor for instances of political violence. While the perceived decline of the UN's influence is often cited as a contributing factor to the rise in cross-border operations (Nyadera & Kisaka, 2020), state fragility or failure can be argued as an equally, if not more, compelling explanation. In many cases, it is the inability or unwillingness of states to control their territories that creates the vacuum in which non-state terrorist groups thrive, necessitating cross-border intervention. This explanation holds particular relevance for the case of Turkish cross-border operations. In this regard, this article posits that state failure is a primary driver of violence in Iraq, and further argues that Türkiye’s cross-border operations do not significantly destabilize Iraq.

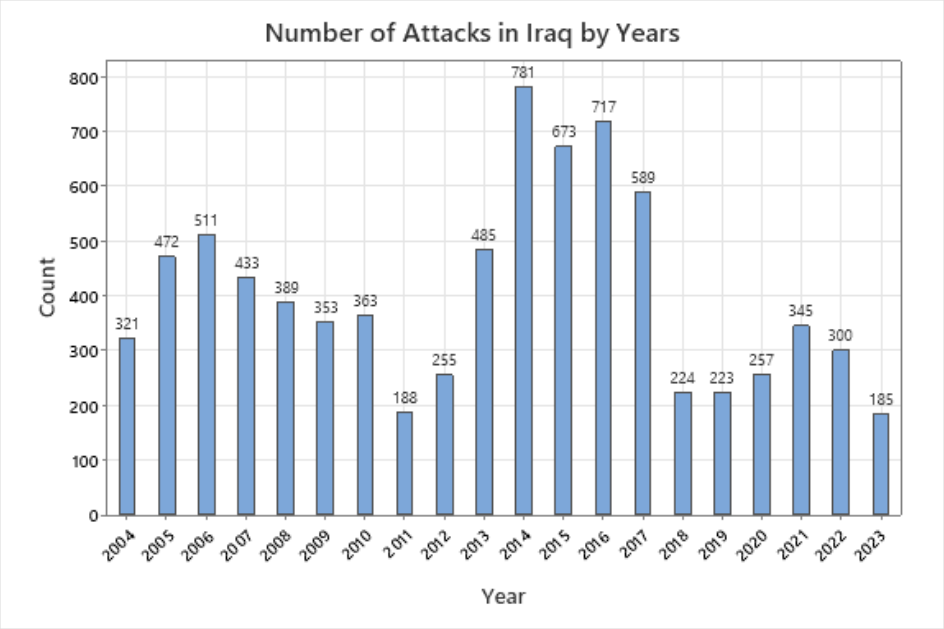
3. DATA AND METHOD

The conflict data was sourced from the Uppsala Conflict Data Program (UCDP). The primary reason for selecting this database is its inclusion of both spatial details, such as coordinates, and demographic information, including dyad names and administrative divisions. Thus, interpolation and spatial analysis could be examined along with. This enables the examination of both spatial distribution and autocorrelation of conflicts. Moreover, UCDP encompasses all conflict data, including attacks by non-state actors as well as interstate wars.

To conduct a spatial analysis of post-war Iraq, the data used in this study covers the period from 2004 onwards. To ensure validity and reliability, the post-2004 period is divided into three sub-periods. The temporal division of the study is based on fluctuations in the number of attacks in Iraq after the US invasion. Graph 1 helps visualize these changing fluctuations in event numbers and their groupings. The first period, from 2004 to 2012, witnessed a surge in attacks primarily perpetrated by insurgent groups. Although the number of events declined somewhat in 2011 and 2012, the emergence of DAESH led to a resurgence, surpassing the levels of the previous period. Consequently, the period between 2013 and 2017, marked by the highest number of attacks, constitutes the second period of this analysis. Following the suppression of DAESH, the number of attacks decreased after 2018. Therefore, the period from 2018 to 2023 represents the final period of this analysis. Graph 1 presents the total number of attacks in Iraq by year.

A total of 8444 events were identified in Iraq between 2004 and 2023. However, only 8064 of these events were included in the analysis due to the unclear locations of 380 events. The UCDP assigned more general locations to these events, such as Eastern Iraq or Iraq, and assigned coordinates randomly. Consequently, this article will focus on the conflicts with identifiable locations. Additionally, 22 different dyad names were recorded by the UCDP in the whole of Iraq. This data was collected to test if there is a relationship between the number of dyads and attack intensity.

Figure Graph 1: Total Number of Attacks in Iraq by Years



Source: Prepared by the authors based on ((Davies et al., 2024))

Two methods can be employed to examine spatial autocorrelation and draw conclusions: interpolation and attribution. Interpolation involves generating a map of conflict points and testing the dependency of the interpolation. Attribution involves assigning a number to each administrative division and then testing the spatial dependency of these divisions. While both methods have their advantages and disadvantages, this paper will focus on the attribution method for two main reasons. First, interpolation carries the risk of data loss, particularly when transforming raster data into polygons. This can compromise the validity and reliability of the analysis. Second, while spatial autocorrelation requires spatial continuity for reliability, interpolation may create gaps, leading to misleading results. Therefore, the hypothesis will be tested by attributing relevant rates to administrative divisions.

To assess regional stability more accurately, attack intensity ratings, rather than the total number of events, were assigned to administrative divisions. This approach, similar to the GIS analyses of Medina et al. (2011) and Siebeneck et al. (2009), addresses potential inconsistencies between the number of events and causalities, which can lead to misleading conclusions about stability. In both

studies, attack intensity ratings were calculated by dividing the sum of total fatalities, injuries, and hostages in a specific time period by the total number of incidents over the same period (Medina et al., 2011, p. 866) (Siebeneck et al., 2009, p. 597). While both studies primarily focused on terrorist activities, data on total causalities, including fatalities, injuries, and hostages, were available from various sources. However, the UCDP database, which includes all political violence events, records only fatalities for each event, not the total number of causalities. For state-to-state and state-to-non-state conflicts, data on total causalities were not recorded. Consequently, the analysis in this study will consider only fatalities when calculating attack intensity ratings. The attack intensity is therefore defined as A = F/T, where F represents the number of fatalities in a specific time and space, and T is the total number of events in the relevant period and location. The UCDP database offers low, high, and best estimates for the number of fatalities, with varying levels of data reliability. For the purposes of this analysis, the "best" estimate, which represents the most likely scenario, is used for all calculations.

Apart from dividing the time period into three stages, spatial analyses will be conducted both including and excluding Türkiye's operations in Iraq. This will help us to identify if there is a marginal contribution of Türkiye's involvement. In this regard, the spatiotemporal analysis will be supported by testing the correlation between dyad numbers and attack intensity. The spatial analyses will be conducted by GIS program. Maps will also be produced by using GIS.

4. SUMMARY OF TÜRKIYE'S CROSS-BORDER OPERATIONS AFTER 2004

Türkiye conducted three major and several minor cross-border operations into Iraq in the post-invasion era. Major operations involved more than 5,000 troops, while minor operations were either aerial strikes or ground operations with fewer than 5,000 troops.

Türkiye's first major cross-border operation occurred in 2007, following the Dağlıca Attack by the PKK in Hakkari province. This attack, which resulted in the deaths of 12 Turkish soldiers, significantly impacted Turkish public opinion and led to an intensification of cross-border operations. Turkish parliament almost unanimously (central-right Justice and Development Party, central-left Republican People's Party and right-wing Nationalist Movement Party voted in favor) issued a memorandum that allows Turkish Armed Forces to commit cross-border operations to Iraq. In response, the Turkish Air Force

launched comprehensive air strikes against PKK targets in Iraq, including strategic locations like Kandil, Zap, and Hakurk.

The operations were not limited to air strikes after the Dağlıca Attack; rather, the first major land operation was launched in February 2008, which was an unusual season for a massive operation, named “Operation Sun”. It was also the first land operation to Iraq after the US invasion. An estimated 8,000 troops were involved in operation according to military sources of Türkiye (Bendern, 2008). Despite the huge amount of military mobility, the operation took eight days eventually Türkiye’s withdrawn as the operation succeeded neutralizing more than two hundred terrorists.

After the operation, however, Turkey's domestic policy shifted towards the Solution Process, a peace initiative aimed at resolving the conflict with the PKK through dialogue and negotiation between 2009 and 2015. Additionally, the rise of DAESH in Syria became a primary security concern for Turkey. The PKK also redirected its focus to the Syrian Civil War. As a result, Turkey's cross-border operations into Iraq were significantly reduced during this period.

After suppressing the threat of ISIS, Türkiye launched a new ground operation against the PKK in Iraq in 2018, codenamed "Operation Tigris Shield." This operation, which extended 15 kilometers into Iraqi territory, aimed to eradicate PKK groups at their source. Unlike previous operations, Türkiye established permanent bases at strategic points in Iraq, enabling sustained and focused cross-border operations. As a result, Türkiye's military presence in Iraq has significantly increased since 2018.

Türkiye's second major cross-border operation into Iraq, codenamed "Operation Claw," commenced in 2019. This operation marked the beginning of a series of significant military campaigns aimed at eradicating terrorist threats targeted Metina, Gara, Avasin, Basyan, and Zap. Invoking Article 51 of the UN Charter, Türkiye sought to establish a 30-kilometer security zone within Iraqi territory. The most recent major operation in this series, "Operation Claw-Locked," was conducted in 2022.

Overall, Türkiye's cross-border operations into Iraq have been driven by security concerns, aiming to establish a secure border, limit the PKK's freedom of movement, and contribute to regional stability. However, these operations have also drawn criticism from some regional countries, who argue that they have destabilized the region (Geldi, 2020).

To test these contrasting perspectives, this article employs spatial autocorrelation analysis to examine the impact of Turkish cross-border operations on attack intensity and the spatial patterns of attacks in Iraq, both before and after Turkish intervention. The following section presents the results of the regression

analysis of attack intensity and dyad number, as well as the spatiotemporal analysis of attacks in Iraq.

5. RESULTS

5.1. Summary of Violent Events

Table 1 demonstrates the total events, death numbers, attack intensity, and dyad number in accordance with provinces. Accordingly, although Al Muthanna has the lowest number of events and deaths, its attack intensity is close to the mean. This means the magnitude of attacks has more destructive effects in that province. Ninawa, on the other hand, has the greatest number of events and deaths, and its attack intensity rate is significant.

Table 1: Events, Deaths, Attack Intensity and Dyad Number in Iraq between 2004-2023

Provinces	Events	Deaths	Attack Intensity (Death/Events)	Dyad Number
Al Anbār	1220	16729	13,71229508	7
Al Başrah	85	597	7,023529412	7
Al Muthanná	5	45	9	2
Al Qādisīyah	16	98	6,125	5
An Najaf	50	825	16,5	5
Arbīl	335	2197	6,558208955	7
As Sulaymānīyah	54	137	2,576923077	6
Bābil	105	1943	18,5047619	6
Baghdād	1421	13583	9,558761436	15
Dahūk	417	1325	3,177458034	2
Dhī Qār	20	266	13,3	4
Diyālá	692	5190	7,5	12
Karbalā’	54	641	11,87037037	6
Kirkūk	469	4975	10,60767591	9
Maysān	16	103	6,4375	5
Nīnawá	2305	25201	10,93318872	10
Ṣalāḥ ad Dīn	759	9036	11,90513834	9
Wāsiţ	41	449	10,95121951	5

Source: Prepared by the authors based on ((Davies et al., 2024))

To begin the statistical analysis of the number of actors in the conflict area, Table 1 prompted us to investigate the correlation between the number of actors involved in violent events (dyad number) and their potential impact on attack intensity. This led us to set the following hypothesis as: *H_0: There is no relationship between the dyad number and attack intensity in Iraq.*

Table 2: Regression Analysis for Attack Intensity and Dyad Number

p value	**R-square**	**r**
0,774	0,53	0,07

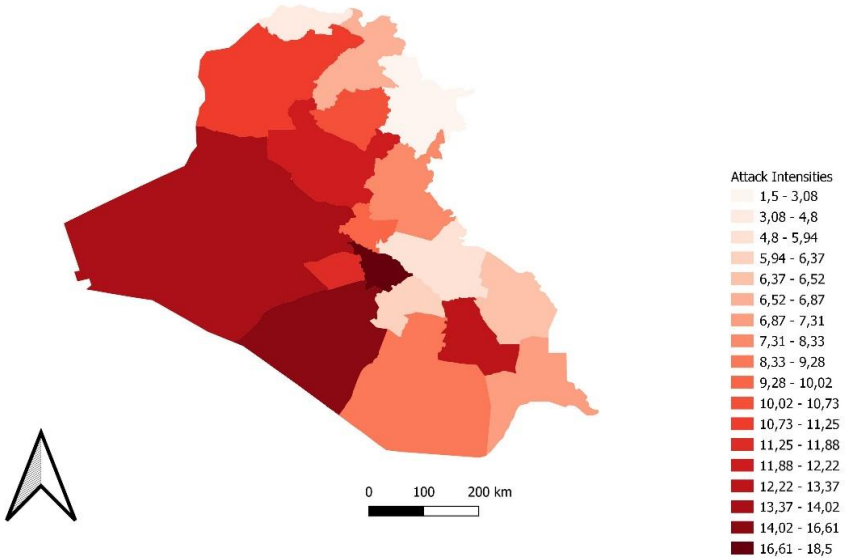
Table 2 demonstrates the results of regression analysis examining the relationship between attack intensity and the dyad numbers. With a p-value greater than 0,.05, the null hypothesis is not rejected. This means that, contrary to some expectations, the effect of the number of dyads on attack intensity is not statistically significant in the events of Iraq at the 0,05 significance level. A very low r value, which is 0,07, supports this result. It indicates a very weak linear relationship between the dyad number and attack intensity. The 0,53 R-squared value suggests that 53% of the variance in attack intensity is explained by the dyad number. This suggests that the number of dyads, as measured in this analysis, does not demonstrate a statistically significant linear effect on attack intensity in Iraq at the 0.05 significance level. Therefore, based on this analysis, we cannot conclude that an increase in the number of involved actors directly correlates with increased attack intensity. This finding suggests that an increase in the number of actors, including Türkiye, does not translate to a statistically significant linear increase in attack intensity. In other words, any actor's involvement, including Türkiye's, does not have a marginal effect on instability in Iraq. Having demonstrated the general relationship between attack intensity and the number of dyads, we will now turn to the main purpose of the article, which is the spatial analysis of violent events in Iraq.

5.2. Spatial Analysis Results in General

To understand the spatial patterns of violent events in Iraq, two tests, namely Global Moran's I* and Getis-Ord General G, will be conducted. Global Moran's I* will demonstrate the spatial autocorrelation. That is to say, it will test if the attacks in each administrative level could be explained by geographical location. Global Moran's I* can take a value between +1 and -1, where in the former situation, spatial dependence is high, indicating clustering of attacks, and the latter indicates dispersed attack locations. In this case, attacks occur in different places. If the result is close to zero, it means that the attacks are

randomly distributed. Getis-Ord General G, on the other hand, will show the hot spots and cold spots of attack intensities. That is to say, it will test if the intensity rates in some administrations are significantly different from other locations. Similarly, Getis-Ord General G can take a value between +1 and -1, where +1 means a hot spot and -1 means a cold spot and zero indicating no clustering.

Figure Map 1: Attack Intensity Intervals between 2004 – 2023



To start with the general results, Map 1 demonstrates the attack intensity intervals based on the data in Table 1. While Babil and Najaf have the highest attack intensity rates in general, Suleymaniyah and Dahuk have the lowest rates, despite Dahuk having a relatively high number of events and death numbers. Having presented the general situation and extreme cases, let us now set the hypothesis for our spatial analysis. In this regard, the main hypothesis of the article is *H_0: There is no clustering in violent attacks in Iraq*. To test the hypothesis, Global Moran's I* and Getis-Ord General G were conducted. The results are as follows: Table 3: Global Moran's I* and Getis-Ord General G analyses for Iraq in 2004-2023

	Observed Index	z-score	p-value
Global Moran's I*	-0,016179	0,346509	0,728960
Getis-Ord General G	0,000002	0,635708	0,524966

The conclusion that there is no indication of clustering (either overall or localized) in violent incidents in Iraq is strengthened by the findings of Moran's I and Getis-Ord General G, which both show no significant spatial autocorrelation. This suggests that spatial characteristics like proximity or geographic features have little bearing on the distribution of violent attacks, which are essentially random.

However, since violent events have fluctuated throughout the 20 years, we will test the same hypothesis for the aforementioned time periods to reach reliable and valid results. Additionally, attack intensity rates with and without Türkiye's involvement will be tested separately.

5.3. Spatial Analysis between 2004-2012

The years between 2004 and 2012 were characterized mostly by suicide attacks in Iraq. The events were mostly concentrated in Ninawa, Baghdad, and Al Anbar, while Dahuk, Najaf, and Karbala were calculated as the most intensively attacked administrations. It is worth noting that this time span is the only period in which all provinces in Iraq were victimized by violent events. Table 4 demonstrates the numbers. This time span coincides with Türkiye's first cross-border military operation to Iraq after the US invasion, which is named 'Operation Sun' in 2008. However, it was not the only military campaign Türkiye conducted. In the end, 25 events in this period were conducted with Türkiye's involvement out of 3341 total events, which constitutes 0.7% of all events in the respective period. Türkiye's involvement was observed in three provinces, namely Arbil, Sulaymaniyah, and Dahuk. It should be highlighted that the attack intensity of Arbil is greater without Türkiye's operations. In this regard, Maps 2 and 3 demonstrate attack intensity rates in Iraq with and without Türkiye's operations, respectively. While the highest rate of attack intensity is in Dahuk in general, without Türkiye's operations, it is in Arbil and Najaf. This leads us to test both situations in the spatial analysis.

Table 4: Events, Deaths, and Attack Intensity in Iraq between 2004-2012 with and without Türkiye's Involvement

Provinces	Events	Death	Attack Intensity	Events w/o Türkiye	Death w/o Türkiye	Attack Intensity w/o Türkiye
Al Anbār	458	4633	10,11572	458	4633	10,11572
Al Başrah	69	495	7,173913	69	495	7,173913
Al Muthanná	2	8	4	2	8	4
Al Qādisīyah	15	98	6,533333	15	98	6,533333
An Najaf	43	779	18,11628	43	779	18,11628
Arbīl	26	386	14,84615	17	288	16,94117
As Sulaymānīyah	14	57	4,071429	11	33	3
Bābil	62	824	13,29032	62	824	13,29032
Baghdād	764	6509	8,519634	764	6509	8,519633
Dahūk	7	153	21,85714	0	0	0
Dhī Qār	11	128	11,63636	11	128	11,63636
Diyālá	290	2313	7,975862	290	2313	7,975862
Karbalā'	34	515	15,14706	34	515	15,14706
Kirkūk	94	364	3,87234	94	264	2,808510
Maysān	10	96	9,6	10	96	9,6
Nīnawá	1151	4464	3,878367	1151	4464	3,878367
Şalāḩ ad Dīn	212	1562	7,367925	212	1562	7,367925
Wāsiţ	23	263	11,43478	23	263	11,43478

Source: Prepared by the authors based on ((Davies et al., 2024))

Figure Map 2 and 3: Attack Intensity Rates between 2004 – 2012 with and without Türkiye

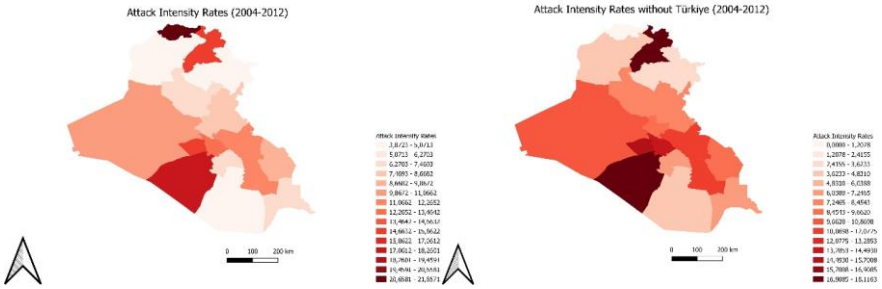


Table 5 demonstrates the results. Global Moran's I* reflects a random distribution in the general analysis. A very close result to 0 with a z-score of 0.34 indicates a random spatial pattern in the events in Iraq between 2004 and 2012. The Getis-Ord General G result supports the random distribution. A very close result to 0 shows the lack of hot spots and cold spots. When focusing on the results without Türkiye, Global Moran's I* is observed to be 0.032212, again indicating a random distribution. Although the increase may suggest a potential trend towards a more clustered pattern, the change is still not statistically significant due to the relatively high p-value. Therefore, the results are still interpreted as a spatially random distribution.

Table 5: Global Moran's I* and Getis-Ord General G analyses for Iraq in 2004-2012 with and without Türkiye

		Observed Index	**z-score**	**p-value**
General	Global Moran's I*	-0,017426	0,339105	0,734531
	Getis-Ord General G	0,000002	0,065715	0,947605
Without Türkiye	Global Moran's I*	0,032212	0,734054	0,462916
	Getis-Ord General G	0,000002	1,181978	0,237214

This leads us to conclude that although Türkiye's operation had a tendency to shift the clustered pattern, in the end, their marginal contribution was still limited. With the exception of Dahuk, Türkiye's involvement did not have

significant effect on attack intensity or a game-changing effect on the spatial pattern.

5.4. Spatial Analysis between 2013-2017

2013 was a milestone for Iraq due to the triggered attacks of DAESH. Owing to the DAESH offensive, the time period between 2013 and 2017 witnessed the highest average attack intensity rate as it is seen in Table 6. The years from 2014 to 2017 also hold the record number of total events in Iraqi history. Throughout this period, violent attacks were intensified in Ninawa and Al Anbar in terms of events and total deaths. More than 20,000 people were killed in Ninawa in 4 years, and more than 11,000 in Al Anbar. Yet, attack intensity rates were highest in Babil and Kirkuk, which are 28.73684211 and 20.31914884, respectively. Map 4 and 5 reflect the attack intensity maps between 2013 and 2017 with and without Türkiye.

The rates remain the same when excluding Turkey's operations. Despite Turkey shifting its attention to the YPG and DAESH in Syria, 37 events conducted by Turkey were recorded, which constitutes 1,1% of all events in Iraq. While Dahuk and Suleymaniyah's attack intensity rates were increased by Turkey's operations, the rate of Arbil increased when Turkey's operations were excluded.

Table 6: Events, Deaths, and Attack Intensity in Iraq between 2013-2017 with and without Türkiye's Involvement

Provinces	Events	Death	Attack Intensity	Events w/o Türkiye	Death w/o Türkiye	Attack Intensity w/o Türkiye
Al Anbār	671	11731	17,4828614	671	11731	17,4828614
Al Başrah	9	90	10	9	90	10
Al Muthannā	3	37	12,33333333	3	37	12,33333333
An Najaf	4	22	5,5	4	22	5,5
Arbīl	61	932	15,27868852	43	770	17,90697674
As Sulaymānīyah	1	6	6	0	0	0
Bābil	38	1092	28,73684211	38	1092	28,73684211
Baghdād	577	6608	11,45233969	577	6608	11,45233969
Dahūk	18	202	11,22222222	1	0	0
Dhī Qār	6	102	17	6	102	17
Diyālá	195	2295	11,76923077	195	2295	11,76923077
Karbalā'	13	91	7	13	91	7
Kirkūk	188	3820	20,31914894	188	3820	20,31914894

Maysān	2	4	2	2	4	2
Nīnawá	1035	20215	19,53140097	1034	20210	19,54545455
Ṣalāḥ ad Dīn	406	6852	16,87684729	406	6852	16,87684729
Wāsiṭ	18	186	10,33333333	18	186	10,33333333
Al Qādisīyah	0	0	0	0	0	0

Figure Map 4 and 5: Attack Intensity Rates between 2013 – 2017 with and without Türkiye

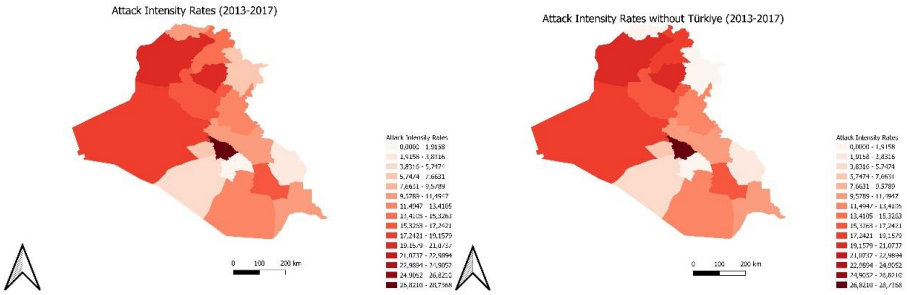


Table 7 reflects the spatial results. Accordingly, Global Moran's I* indicates a random spatial distribution between 2013 and 2017. The observed index of -0.166366 with a z-score of -0.887352 means that the pattern does not appear to be significantly different from random. The Getis-Ord General G results support the results of Global Moran's I*. Excluding Türkiye's involvement has a tendency to slightly shift towards clustering but not at a significant level. Therefore, with and without Türkiye, the spatial pattern is random.

Table 7: Global Moran's I* and Getis-Ord General G analyses for Iraq in 2013-2017 with and without Türkiye

		Observed Index	**z-score**	**p-value**
General	Global Moran's I*	-0,166366	-0,887352	0,374889
	Getis-Ord General G	0,000002	0,090439	0,927938
Without Türkiye	Global Moran's I*	-0,225636	-1,349456	0,177191
	Getis-Ord General G	0,000002	0,189617	0,849609

5.5. Spatial Analysis between 2018-2023

Iraq has become relatively calm since 2018, despite ongoing conflict with DAESH. Still, owing to the Iraqi government's offensives in Mosul and Al Anbar, the terrorist group was significantly suppressed. Table 8 reflects the relatively low numbers of events, deaths, and attack intensity rates. As shown in the table, this period is not only characterized by a relatively low amount of attacks but also the lowest average attack intensity rate. Dahuk, Arbil, and Diyala recorded the most events, while Dahuk, Arbil, and Kirkuk recorded the most deaths. In contrast, no attacks were recorded in two provinces, namely Muthanna and Wasit, and only one event without any casualties was observed in Qadisiyah. As a result, the attack intensity rates of three provinces became 0. Except for Dhi Qar and Najaf provinces, attack intensity rates are less than 5,4.

Türkiye's relative intervention is more visible in this period compared to previous years. It launched two operations in 2019 and 2022, which resulted in 658 total events out of 1534. Dahuk and Arbil are the provinces that received the most frequent attacks. However, the attack intensity rate in Arbil is greater without Türkiye's operations. Therefore, the province is already a conflict zone in Iraq. In contrast, all events in Dahuk were caused by Türkiye's operations. Map 6 and 7 shows the differences with and without Türkiye.

Table 8: Events, Deaths, and Attack Intensity in Iraq between 2018-2023 with and without Türkiye's Involvement

Provinces	Events	Death	Attack Intensity	Events w/o Türkiye	Death w/o Türkiye	Attack Intesity w/o Türkiye
Al Anbār	91	359	3,945054945	91	359	3,945054945
Al Başrah	7	12	1,714285714	7	12	1,714285714
Al Muthanná	0	0	0	0	0	0
Al Qādisīyah	1	0	0	1	0	0
An Najaf	3	24	8	3	24	8
Arbīl	248	879	3,544354839	52	292	5,615384615
As Sulaymānīyah	39	77	1,974358974	10	13	1,3
Bābil	5	27	5,4	5	27	5,4
Baghdād	80	384	4,8	80	384	4,8
Dahūk	392	970	2,474489796	0	0	0
Dhī Qār	3	36	12	3	36	12
Diyālá	207	524	2,531400966	207	524	2,531400966
Karbalā'	7	35	5	7	35	5

Kirkūk	187	782	4,181818182	180	592	3,288888889
Maysān	4	3	0,75	4	3	0,75
Nīnawá	119	429	3,605042017	86	436	5,069767442
Şalāḥ ad Dīn	141	599	4,24822695	141	599	4,24822695
Wāsiṭ	0	0	0	0	0	0

Source: Prepared by the authors based on ((Davies et al., 2024))

Figure Map 6 and 7: Attack Intensity Rates between 2018 – 2023 with and without Türkiye

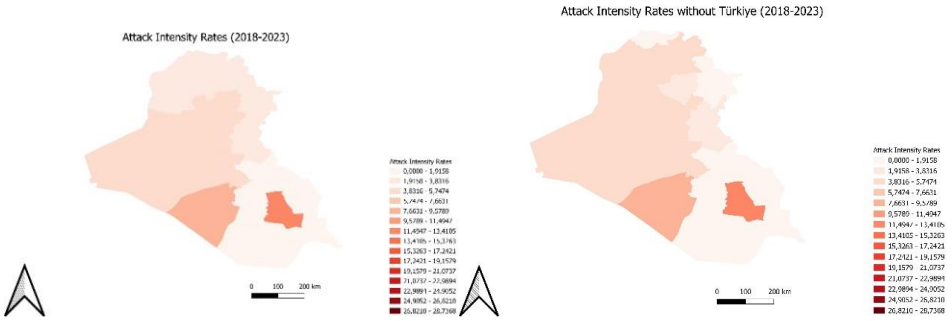


Table 9 reflects the spatial results. Accordingly, due to the decreasing rates of attack intensity in several provinces, Global Moran's I* of -0.281694 with a z-score of -1.94287 indicates a dispersed pattern in the conflict in Iraq after 2018. However, the Getis-Ord General G score concludes that there are neither hot nor cold spots in the conflict areas. Focusing on Turkey's effects, as has already been demonstrated, Turkey's operations are intensified in Dahuk and Arbil. Yet, the spatial analysis indicates that Turkey's involvement does not marginally affect the cluster. A Global Moran's I* of -0.276132 with a z-score of -1.8389 is very close to the general results that show a dispersed pattern. Turkey's operations do not change the main results.

Table 9: Global Moran's I* and Getis-Ord General G analyses for Iraq in 2018-2023 with and without Türkiye

		Observed Index	z-score	p-value
General	Global Moran's I*	-0,281694	-1,94287	0,052033
	Getis-Ord General G	0,000002	-0,487985	0,625561
Without Türkiye	Global Moran's I*	-0,276132	-1,8389	0,0693
	Getis-Ord General G	0,000002	-0,445183	0,656187

6. DISCUSSION AND CONCLUSION

The main purpose of this article is to test whether Türkiye's cross-border operations to Iraq cause destabilization of the northern region, as claimed in political discussions and literature, or if they have no marginal effect. Throughout this period, Türkiye committed four cross-border operations to Iraq and conducted several small-scaled conflicts in the region. These operations are perceived as a destabilizing factors, so the spatial analysis sough to test this claim. Before starting the spatial analysis, the correlation between the additional actors and attack intensity was tested in general by a regression analysis for violence in Iraq. The model indicates that the number of dyads has no statistically significant effect on attack intensity. Therefore, Türkiye's involvement doesn't change the situation of violent events in Iraq.

Spatial analyses in general and each time period support the regression analysis. The overall results and two sub-periods, namely between 2004 and 2012 and between 2013 and 2017, show that violent events in Iraq cannot be explained by space, because the attack intensity is randomly distributed in the respective periods as well as in the overall period. When Türkiye's operations are omitted from the dataset, despite a slight shift towards clustering, the general result does not change. Therefore, Türkiye's operations do not alter the stability in the northern region.

Thanks to the victory against DAESH, both the number of events and attack intensity significantly decreased after 2018. As a result, the spatial analysis found a dispersed pattern in the relevant period. The results are similar and very close when Türkiye's operations are omitted, despite its significant contribution in Dahuk. One might expect a clustering when omitting data of Türkiye. This would mean that Turkey was a destabilizer in Iraq and in the north of the country. However, the marginal change caused by Türkiye's involvement is very limited, so it does not have a destabilizing effect on the violence in Iraq between 2018 and 2023.

Overall, according to the spatial analysis results, Türkiye's involvement in Iraq has no effect on the general stability pattern of the country or the northern region. The destabilization of Iraq after 2004 is the general situation regardless of the number of actors involved, and no region is different from one another. Therefore, the destabilization in the north of Iraq could be explained by alternative reasons rather than Türkiye's involvement. While this study provides valuable insights, it is crucial to recognize that a more thorough explanation of violent events in Iraq necessitates further research. Specifically, future investigations should expand the variable set and employ spatial dependence analysis, as this method allows for a more detailed examination than spatial autocorrelation.

7. CONFLICT OF INTEREST STATEMENT

There is no conflict of interest between the authors.

8. FINANCIAL SUPPORT

No funding or support was used in this study.

9. AUTHOR CONTRIBUTIONS

The authors' contributions to the study are equal.

10. ETHICS COMMITTEE STATEMENT AND INTELLECTUAL PROPERTY COPYRIGHTS

The study does not require clearance from an ethics commission.

11. REFERENCE

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