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RESEARCH NOTE

Atypical violence and conflict dynamics: evidence from Jerusalem

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Abstract

What is the impact of uncommon but notable violent acts on conflict dynamics? We analyze the impact of the murder of a Palestinian child on the broader dynamics of Israeli-Palestinian violence in Jerusalem. By using novel micro-level event data and utilizing Discrete Fourier Transform and Bayesian Poisson Change Point Analysis, we compare the impact of the murder to that of other lethal but more typical Israeli-Palestinian events. We demonstrate that the murder had a large and durable impact on the average number of daily riots in Jerusalem, whereas the other events caused smaller, short-term effects. We demonstrate that scholars should devote more attention to the analysis of atypical violent acts and indicate a set of tools for conducting such analyses.

Key words: Bayesian; time series models

1. Introduction

Intra-state violent conflicts, especially those unfolding over long periods of time, often have clearly identifiable logic, dynamics, and actors. This allows scholars to uncover important characteristics and outcomes of conflicts, such as civilian targeting (Kalyvas, 2006), repertoires of contentious actions (Tilly, 2010), and cycles of escalation, retaliation, and revenge (Haushofer *et al.*, 2010; Souleimanov and Siroky, 2016).

Yet even conflicts with well-established patterns of contention experience highly unusual but significant events, such as large-scale attacks, mass executions, assassinations, and especially brutal or salient forms of violence. Violent acts are atypical if they differ from the observed contemporaneous conflict dynamics in form and/or the identity of the perpetrators or the victims. Atypical violent acts are identified inductively and are conflict- and period-specific. For example, rape would be atypical in Israel/Palestine but not so in the 1990s Bosnia, whereas the opposite would be true for suicide bombings.

There are several reasons why atypical events might alter pre-existing conflict dynamics. First, atypical violent events can violate existing norms and taboos, be emotionally shocking, create outrage, and mobilize the victim group to escalate violence in retaliation. Second, they provide participants with new, observable information on the violence the other side can and is willing to commit, and thus help to update prior perceptions about motivations, goals, and behavior. Third, they often draw into violence previously excluded actors, as victims and/or as perpetrators.

Atypical events can change conflict dynamics, but how durable is their impact? Are they just notable, but temporary blips, short-term deviations from the normal, established patterns of

contention? Despite the high visibility and importance of such acts, the scholarship has yet to fully explore this question. What is the impact of such atypical events and how can scholars detect such an impact amidst broader conflict dynamics?

We address these questions by focusing on the Israeli-Palestinian conflict. The violence in Israel-Palestine is not only long-lasting but also subject to well-researched cycles of escalation and retaliation (Jaeger and Paserman, 2008), predictable conflict dynamics (Haushofer *et al.*, 2010), and established repertoires and patterns of contention, from stone throwing to suicide bombings. Thus, when on 2 July 2014 three Israeli civilians kidnapped, tortured, and murdered Palestinian teenager Mohammed Abu Khdeir (محمد أبو خضير) (hereafter AK) in East Jerusalem, this unprecedented act was perceived as a deviation from the well-established conflict dynamics (Shehadeh, 2014).[1] That a Palestinian teenager was killed by Israelis was hardly unique; deadly intergroup violence is common in the city. Rather, the mode of the action—Jewish civilians kidnapping, torturing, and murdering a Palestinian for political reasons—was something the city has not witnessed before or since. Our main objective is to analyze how the effects of this event compare to those of other events.

To do so, we compare the impact of the AK murder on patterns and levels of violence to the impact of two more typical violent events that took place in Jerusalem in 2013–2015. These events each also resulted in a single Palestinian fatality. The first was the 2013 anniversary of the Second Intifada, a recurring and predictable standoff. Fifty-one Palestinians, 12 of them children, were injured and one killed during violent clashes. The second is a set of clashes that was touched off by the beginning of Ramadan in 2015.

To establish the independent impact of these events we analyze novel micro-level data obtained from the Israeli police and use two techniques: Discrete Fourier Transform, a signal-processing tool common in engineering and physics but rarely used in political science (i.e., Aguiar-Conraria *et al.*, 2012), and Bayesian Poisson Change Point Analysis. Our analysis demonstrates that the typical Second Intifada commemoration violence and the Ramadan clashes led to short-term and relatively small spikes in riots. On the other hand, the AK murder—a highly atypical event—led to larger and more durable increases in riots in Jerusalem.

This research note makes both substantive and methodological contributions. First, we show that atypical violent events can fundamentally alter established conflict dynamics and have durable effects even in protracted, well-choreographed conflicts with predictable cycles and repertoires. Therefore, scholars cannot fully understand conflict dynamics by focusing only on the established, typical, and predictable patterns of violence. In the conclusion, we expand on how future research can build on this paper. Second, by utilizing DFT, we expand the political violence analysis toolkit. Political violence is a dynamic, complex, and often non-linear process, and therefore standard analytical tools and methods have important limitations (Bohorquez *et al.*, 2009; Helbing *et al.*, 2015). The application of DFT improves our understanding of conflict and opens new possibilities for analyzing structured, cyclical dynamics of contention.

2. Political violence in Jerusalem

In the aftermath of the Six-Day War, the Israeli government annexed East Jerusalem, creating a sharply divided and highly segregated city featuring Jewish neighborhoods in the West and Palestinian neighborhoods in the East. The city remains segregated and divided economically, socially, and politically. Political violence is a constant feature of city life. Typical modes of contention, such as stone throwing and what Balcells *et al.* (2016) define as "low intensity violence", are regularly present in Jerusalem. Under such conditions of established patterns of contention, including numerous violent events with multiple victims, the *ex-ante* likelihood of a single event

[1]Indeed, the event was so unusual that it became the focus of an HBO miniseries: *Our Boys*.

with a single victim having a significant impact on conflict dynamic for a long period is low, making Jerusalem a hard case in which to uncover the impact of a single non-typical conflict event.

The conflict intensified substantially in the summer of 2014. On 12 June, a cell of Hamas, an Islamic terrorist organization, kidnapped and murdered three Israeli teenagers who were hitchhiking in the West Bank. Their bodies were discovered 18 days later, and the teenagers' funeral sparked rallies, calls for revenge, and sporadic Jewish mob attacks against Arab civilians.

On 2 July 2014 three young religious Jews, 29-year-old Yosef Chaim Ben David and two of his relatives, both minors, took it upon themselves to avenge the teenagers' murder. Ben David, the driving force behind the revenge plan, was not previously engaged in political activism or violence. Ben David and his accomplices kidnapped AK, a randomly targeted resident of the Shu'fat (شعفاط) neighborhood in north-east Jerusalem, tortured, and brutally murdered him. The event immediately sparked riots in Shu'fat and other parts of the city. The war between Israel and Hamas in the Gaza Strip, which followed later in July, also contributed to the clashes. In the two-month period following the AK murder more than 100 Palestinians and 20 Israelis were killed and many more injured—a substantial escalation from the previous patterns of violent but largely non-lethal conflict.

3. Data

We use geo-coded incident-level data obtained from the Israeli Police obtained under the Israeli Freedom of Information legislation. The police data include all reported incidents of crime and political violence that took place within the municipal borders of Jerusalem between January 2013 and December 2015. Police reports consist of a verbal description of the event; demographic information (age, religion, gender) and place of residence (listed in the reports as "statistical areas", which largely correspond to neighborhoods) of both victims and suspects; and the police file number.

Some incidents include incomplete data, most often a reported victim but no suspect. This can occur for several reasons. Some reported incidents turn out to be false and hence do not result in any suspect being detained. Not all events that do have a suspect would have a recorded victim, e.g., attacks against municipal or state property. We use only events for which we have complete data. Our data set includes 48,507 events, which include the date, location, type of violation committed, and demographic data on suspect(s) and victim(s).

Police records include a detailed classification of over 100 different crimes and violations, such as loitering, rape, burglary, physical assaults against police officers, homicide, stone, and Molotov cocktail throwing. We focus in this paper on incidents involving riots. In the Arab neighborhoods of Jerusalem, riots predominantly feature groups of demonstrators targeting Jewish/Israeli civilians and Israeli security forces and property, and do not target Arabs. At least one riot occurred on 967 (88 percent) of the 1096 days in our data. Figure 1 shows the weekly counts of riots during the years 2013–2015. There were 4590 riots in total, with as many as 37 on one day (6 July 2014). Thirty-five percent of the riots occurred before the AK murder, and 65 percent after.

Our choice of focusing on riots is driven by several main considerations. First, riots are the most prominent forms of Palestinian violence in Jerusalem in recent years. Second, unlike acts of homicide and other violent crimes, which can be either criminally or politically motivated, riots are unambiguously a form of political and social violence. Third, contrary to other forms of intergroup violence, such as physical assaults against civilians, riots are unlikely to be under-reported. By contrast, we expect that attacks against police—a category that encompasses a range of actions—might be over-reported.

4. Methods and results

What was the impact of the AK murder on the broader patterns of riots in Jerusalem, and how does that impact compare to that of other events? To answer these questions, we need to (1)

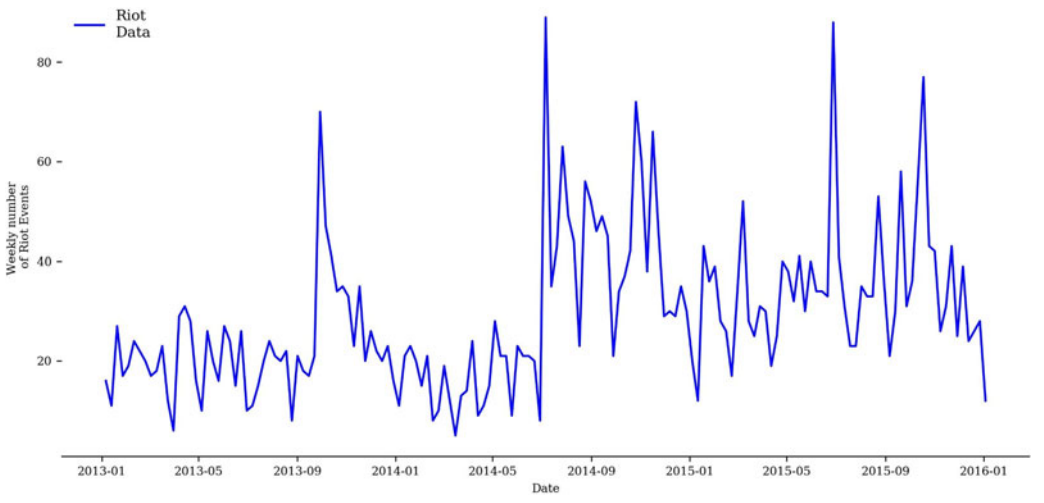

Figure 1. Weekly riots in Jerusalem, 2013–2015.

isolate the impact of the murder; and (2) compare that impact to that of other events that could have and did lead to increases in violence.

The key challenge with analyzing the effect of a single event such as this one is isolating its impact on the time series. Riots in Jerusalem result from long-term processes and are subject to shorter-term cycles, so assessing the impact of the AK murder requires us to net out these other factors that explain riots. We begin by using Discrete Fourier Transform (DFT) (Cooley *et al.*, 1969), a model that estimates cycles (or frequencies) and their strength (or amplitudes) based on time-series data. Transforming the time series into its frequency components allows us to isolate the extent to which the data are explained by cyclic patterns (e.g., weekly or daily cyclic behaviors). Similar tools have been used in political science, including to analyze cycles of elections, wars, terrorist attacks, and even political cycles' influence on the stock market (Herbst and Slinkman, 1984; Im *et al.*, 1987). Yet this prior work mostly focuses on *identifying* cycles. For example, the US might have co-evolving cycles for House, Senate, and Presidential elections with different degrees of intensity across time. Our approach, on the other hand, is to utilize DFT to filter out cycles and thus better understand *non-cyclic* phenomena. In other words, after measuring the cycles of violence, we recreate (inverse transform) our data netting out the strong cyclic frequencies. This allows us to examine the extent to which specific events are not part of the regular cycle and the extent to which such events have enduring effects.

This approach outperforms other methods used to detect seasonality in data. For example, Exponential Weighted Moving Average (EWMA) (Holt, 2004) requires delicate fitting, which might create error. DFT, however, is a strictly mathematical transformation of the data into a spectral dimension, which does not have the potential for information loss, unlike EWMA and similar methods. Seasonality methods also perform poorly, unlike DFT, when several cycles co-exist simultaneously, as might be in the case of our data.

To illustrate this method, consider the example of demand for electricity over time. One can imagine a cycle occurring every 24 h, increasing in the morning when people wake up and decreasing at night when users go back to sleep. DFT would detect a strong cycle of 24 h. Yet there could also be anomalous daily power demand—for example, as a result of a local festival or holiday, which DFT would detect after filtering out the daily cycle. DFT can also detect broader cyclical patterns (e.g., seasonality) that occur alongside daily cycles. By removing all such strong cycles, we can recreate a time series representing only unique, non-cyclical electricity consumption. We use the same method to analyze the riots data. We identify cyclical patterns

occurring in Jerusalem (typically every week—on Fridays), remove them from the overall data and recreate the time series in order to identify the unique consequences of specific events.

Formally, DFT is presented by the following mathematical notation[2] where x_n is the time series. N is the number of data points in x_n. k is the sinusoid frequency. X_k is a sequence of complex numbers with a length N representing each of the k frequencies. This calculation was done using the Fast Fourier Transform algorithm.

$$X_k = \sum_{n=0}^{N-1} x_n e^{-\frac{i2\pi}{N}kn} = \sum_{n=0}^{N-1} x_n \times \left[\text{coscos}\left(\frac{2\pi kn}{N}\right) - i \times \sin(2\pi kn/N)\right]$$

We keep our approach simple by selecting frequencies with amplitudes above the 95 percentile—a threshold calculated using a bootstrap confidence procedure to mitigate the chance of selecting noise frequencies. Twelve different frequencies, ranging from 3.5 days to 1 year were selected using this procedure. For threshold sensitivity we repeated this procedure for the 99th percentile. The cycles of 7 days and 1 year kept their predominance under this higher threshold, but overall the results did not change. For the rest of the analysis, we show the 95 percentile results.

We compare the effects of the AK murder to those of other events using two steps. First, we select a list of candidate events that could plausibly have led to sharp increases in Jerusalem riots. Second, we select from those candidate events a list of three events—including the murder—that led to sharp increases in riots, and compare the effects of those three events. Violence in Jerusalem typically unfolds following significant commemoration dates. The most prominent of these are: Jerusalem Day, during which Jews commemorate the city's unification, the anniversary of the 1967 war, the outbreak of the Second Intifada, and the beginning and end of the Muslim holy month of Ramadan. We assess the impact of these events, as well as the AK murder, as described in detail in the online Appendix. Our analysis suggests that three events during 2013–2015 were followed by especially large increases in riots: the 2013 Anniversary of the Second Intifada, the AK murder, and the beginning of Ramadan in 2015.

The relationship between these events and riots is visually described in Figure 2. The top panel (blue line) shows the original riot data. The middle panel (green line) exhibits only the cyclical rioting behavior (as estimated using DFT), showing a complex pattern, but also indicating that some of the riots in Jerusalem *are* seasonal and come in cycles. Meanwhile the bottom panel (red line) displays the riot data after removing the cyclical behavior. The dotted vertical lines represent the five annual candidate events. The AK murder occurred between events c and d in 2014.

Figure 3 takes the lower panel of Figure 2 and, for each of the three events, shows the riots in the periods before, during, and after the event that remain after we remove cycles. The visual differences across the panels are noteworthy. The top panel shows that riots increased sharply around the 2013 anniversary of the Second Intifada, but quickly returned to previously low levels. However, the second panel shows that following the AK murder riots remained elevated for a considerable time compared to prior to the murder. Finally, the bottom panel shows that riots were similarly elevated both before and after the beginning of Ramadan in 2015. Table 1 provides a quantitative description of these results. Most importantly, it provides a ratio between the number of riots in the 60 days before and 60 days after each event. Riots increased after the murder by a factor of 11.29, as compared to 2.44 and 0.87 for the other events, the latter actually indicating a decrease in riots in the 60 days after the beginning of Ramadan in 2015. In fact, when we expand the temporal scope of the analysis further, we find similar results. Comparing the 250 days before (going back to the first date for which we have data) and after the 2013 Anniversary of the Second

[2]Notice the formula is for the discrete Fourier transform which is more relevant to our discrete data. A continuous form exists as well.

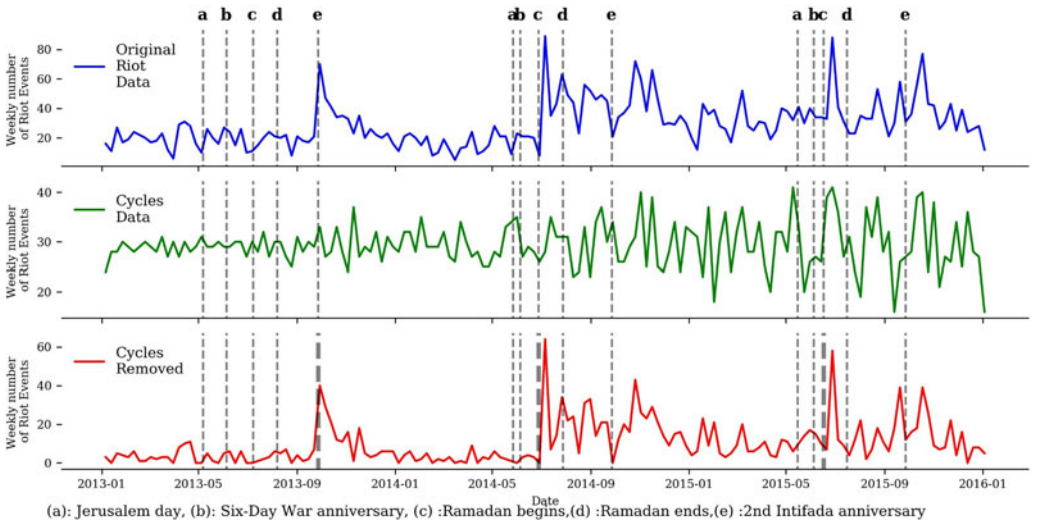

Figure 2. Selecting cases for comparison – riots in Jerusalem, 2013–2015. The top panel shows all riot events. The middle panel depicts filtered riot data that contains only the prominent cycles. The bottom panel visualizes the riot data after cyclic behavior is removed. Dashed lines symbolize annual events. Bold dashed lines in the bottom panel refer to our case selection – the 2013 Second Intifada anniversary, the AK murder, and the 2015 beginning of Ramadan.

Intifada, the average number of daily riots increased from 0.55 to 0.79, a factor of 1.44. However, in the 250 days before and after the AK murder, daily riots increased from 0.79 to 2.2, a factor of 2.78. Overall, our results demonstrate that (1) multiple events precipitated short-term increases in daily riots; but (2) unlike other events, the AK murder had a larger and more enduring effect.

In addition to changing the frequency of riots over time, did the AK murder lead to a fundamental change in the patterns of contention or are we simply observing an amplification of the already ongoing processes? To answer this question, we conduct a Bayesian Poisson Change Point

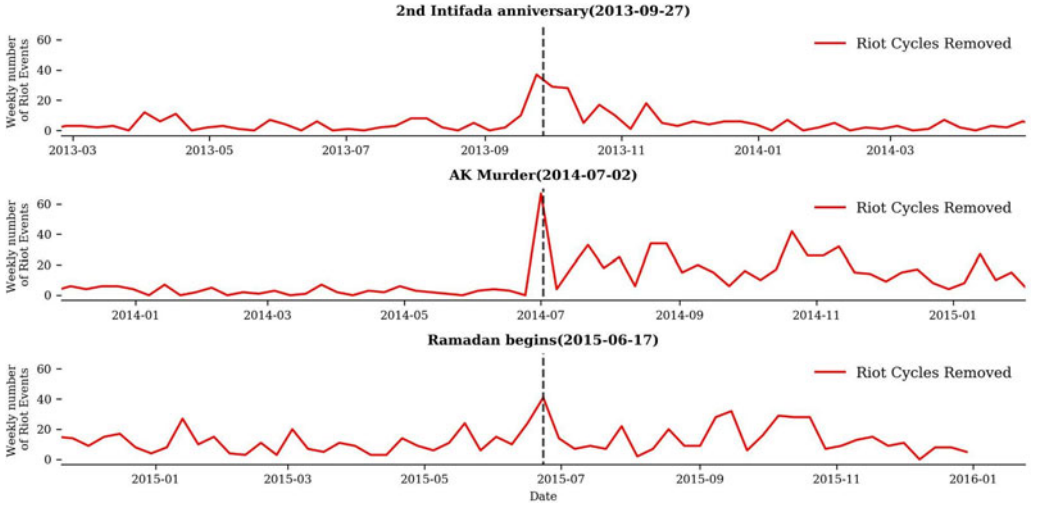

Figure 3. Riot patterns before and after major events (cycles removed). The top panel displays riots 60 days prior to and after the Second Intifada anniversary; the middle panel and bottom panels show similar riot data for the AK murder and the beginning of Ramadan.

Table 1. Riots before and after Three Key Events

Event	Mean daily riots in 60 days before	Mean daily riots in 60 days after	After/before ratio
Anniversary of second Intifada, 27 September 2013	0.92	2.25	2.44
Murder of Abu Khdeir, 2 July 2014	0.34	3.84	11.29
Ramadan begins, 17 June 2015	2.30	2.00	0.87

Analysis in which the daily count of riots is the outcome variable, and the previous day's count of riots is the predictor. The model estimates whether, at some point in the time series, the relationship between the incident count in day t and the incident count in day $t-1$ changed significantly. This can occur when an important exogenous event leads to a much greater or much smaller number of events in day t than we would expect based on the number of events in day $t-1$ – *and* when this change in the relationship persists over a sufficient number of days.

This type of analysis is often highly sensitive to parameters and time spans used, yet our analysis provides robust evidence that a change point in the pattern of riots indeed took place on 2 July 2014, the day of the AK murder. This result is consistent when using the full data spanning 2013–2015, when we end the analysis at the end of July 2014; and when we begin the analysis in June of 2014. We also estimated a set of models that assume a range of change points from 1 to 10. Each of these models identified 2 July 2014 as a change point, indicating this is the date of the most important change in the data-generating process. Detailed information is provided in the online Appendix. This analysis indicates that, not only did a change point occur on 2 July 2014, the day of the AK murder, but that we can be quite certain that the riots that occurred before and after that date resulted from significantly different data-generating processes.

5. Conclusion

Do atypical violent acts have a durable impact on conflict dynamics? We answer this question by analyzing the effects of the AK murder. By utilizing novel police data and using DFT techniques and Bayesian Poisson Change Point Analysis, we demonstrate that the AK murder had a large impact on riots in Jerusalem as compared to other events during the same era, and that the impact lasted well beyond the original shock. Such a potential effect is not simply an outcome of the target's prominence; a murder, by Jewish civilians, of a teenager randomly chosen on the street can and does leave a profound behavioral legacy.

This suggests that rare, extraordinary violent events merit serious attention in political violence and contentious politics scholarship. From a methodological perspective, our approach is especially promising for the analysis of contentious politics in settings with clearly established, recurring repertoires and cycles, such as "Monday Demonstrations" in East Germany in 1989–1991, ongoing "Wednesday Demonstrations" in front of the Japanese Embassy in South Korea, and settings with religiously or politically mandated events calendars.

Perhaps more importantly, we hope scholars will use this contribution as the basis to develop a broader research agenda. Many conflicts, especially civil conflicts, endure for years and sometimes decades. On the one hand, such conflicts tend to feature cycles of violence with familiar patterns; on the other hand, long-term conflicts are also known to abruptly escalate, de-escalate, and evolve. Our analysis demonstrates that one catalyst for such changes can be an atypical event. This raises several important questions for future work. First, what are the mechanisms? What is it about atypical violent acts that can make them impactful? Why would a particular civilian murder, such as the AK murder, have a lasting impact on a conflict that is already known to feature many civilian killings?

Second, why do some atypical events have important impacts while others do not? Although we have analyzed a particularly impactful atypical event, there are surely many others that did not

have such an impact. We hope future work will analyze the scope conditions that determine the impact of such violent events on the broader conflict dynamics. A final area for future research concerns the durability and magnitude of the effects of atypical events. How long do these effects endure, and why? Do some atypical violent acts have larger and different effects than others? Understanding these relationships will help future researchers better understand how, when, and the extent to which atypical political violence matters most. Scholars of political violence are interested in how and why conflicts begin, change, and end; and this paper demonstrates that atypical events can be part of the explanation for these outcomes.

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/psrm.2022.39 and https://doi.org/10.7910/DVN/MHSJE5.

References

Aguiar-Conraria L, Magalhães P and Soares MJ (2012) Cycles in politics: wavelet analysis of political time series. *American Journal of Political Science* **56**, 500–518.

Balcells L, Daniels L-A and Escribà-Folch A (2016) The determinants of low-intensity intergroup violence: the case of Northern Ireland. *Journal of Peace Research* **53**, 33–48.

Bohorquez JC, Gourley S, Dixon AR, Spagat M and Johnson NF (2009) Common ecology quantifies human insurgency. *Nature* **462**, 911–914.

Cooley J, Lewis P and Welch P (1969) The fast Fourier transform and Its applications. *IEEE Transactions on Education* **12**, 27–34.

Haushofer J, Biletzki A and Kanwisher N (2010) Both sides retaliate in the Israeli–Palestinian conflict. *Proceedings of the National Academy of Sciences* **107**, 17927–17932.

Helbing D, Brockmann D, Chadefaux T, Donnay K, Blanke U, Woolley-Meza O, Moussaid M, Johansson A, Krause J, Schutte S and Perc M (2015) Saving human lives: what complexity science and information systems can contribute. *Journal of Statistical Physics* **158**, 735–781.

Herbst A and Slinkman C (1984) Political-economic cycles in the US stock market. *Financial Analysts Journal* **40**, 38–44.

Holt C (2004) Forecasting seasonals and trends by exponentially weighted moving averages. *International Journal of Forecasting* **20**, 5–10.

Im EI, Cauley J and Sandler T (1987) Cycles and substitutions in terrorist activities: a spectral approach. *Kyklos* **40**, 238–255.

Jaeger D and Paserman MD (2008) The cycle of violence? An empirical analysis of fatalities in the Palestinian-Israeli conflict. *American Economic Review* **98**, 1591–1604.

Kalyvas S (2006) *The Logic of Violence in Civil War*. New York: Cambridge University Press.

Shehadeh R (2014) The meaning of Mohamed Abu Khdeir's murder. *The New Yorker*. Available at https://www.newyorker.com/news/news-desk/the-meaning-of-mohamed-abu-khdeirs-murder.

Souleimanov EA and Siroky D (2016) Random or retributive?: Indiscriminate violence in the Chechen wars. *World Politics* **68**, 677–712.

Tilly C (2010) *Regimes and Repertoires*. Chicago, IL: University of Chicago Press.

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