SOE 6: Political Systems and Conflicts

Time: Tuesday 14:00–15:00 Location: H45

Invited Talk SOE 6.1 Tue 14:00 H45

Analyzing Political Regime Stability Through the Diffusion Equation: Insights from V-Dem Data (1900-2021) — •Karoline Wiesner — University of Potsdam, Potsdam, Germany

Democratic stagnation and autocratic resurgence have marked the 21st century, raising questions about the stability of democracies and their implications for peace and prosperity. Utilizing the diffusion equation from statistical physics we provide firm evidence that democracy is the most stable regime type across the 20th and 21st centuries on average, surpassing the average life time of electoral autocracies. The latter also exhibit heightened susceptibility to sudden collapse. We explore these dynamics using the Diffusion Map dimensionality-reduction technique applied to V-Dem data (1900-2021). In this context, we will discuss some less explored mathematical aspects of the diffusion-map method, including its probabilistic interpretation and sensitivity to parameters and to the structure of the data. These recent results will be of interest, not least, to those wanting to apply the method to socio-economic data.

Wiesner, K., Bien, S., & Wilson, M. C. (2024). The principal components of electoral regimes: separating autocracies from pseudo-democracies. Royal Society Open Science, 11(10), 240262.

Pirker-Díaz, P., Wilson, M. C., Beier, S., & Wiesner, K. (2024). Unraveling 20th-century political regime dynamics using the physics of diffusion. arXiv preprint arXiv:2411.11484.

SOE 6.2 Tue 14:30 H45

Knowing armed conflict type hurts prediction — •Niraj Kushwaha[1], Edward D. Lee[1], and Woi Sok Oh[2] — [1]Complexity Science Hub, Austria — [2]Princeton University, USA

Moving beyond heuristic classifications of armed conflicts such as local, civil, interstate wars etc. to systematic categorization is useful but challenging. Using information-theoretic techniques we generate chains of related conflict events from the high-resolution Armed Conflict & Location Event Dataset and integrate them with other datasets spanning climate, geography, infrastructure, economics, raw demographics, and composite demographics. Using an unsupervised clustering algorithm based on multinomial mixture, we discover that three conflict archetypes exist; "major unrest," "local conflict," and "sporadic & spillover events." Major unrest predominantly occurs in densely populated areas with good infrastructure and flat, riparian geography. Local conflicts arise in mid-populated regions with diverse socio-economic and geographical features. Sporadic and spillover conflicts are small, occurring in sparsely populated areas with poor infrastructure and economic conditions. The three types stratify into a hierarchy of factors, revealing a quantitative taxonomy that highlights population, infrastructure, and economics as the most discriminative variables. Surprisingly, we find that knowing the type negatively impacts predictability of conflict intensity such as fatalities, conflict duration, and other measures of size. Hence, we develop an empirical and bottom-up approach that identifies conflict types but also cautions us about the limited utility of public data sets for conflict prediction.

SOE 6.3 Tue 14:45 H45

On the coincidence of weather extremes and geopolitical conflicts: Risk analysis in regional food markets — •Nkongho Ayuketang Arreyndip — Economic analysis of Climate Impacts and Policy Division, Euro-Mediterranean Center on Climate Change(CMCC), Via della Libertà, 12- 30175 Venice (VE), Italy.

Under increasing geopolitical tensions between important breadbaskets and climate extremes, the co-existence of weather and geopolitical extreme events can lead to devastating agricultural production losses. These losses can affect the entire food supply chain and lead to food shortages and price increases in regional markets. This work models these events' impacts taking the Russian-Ukrainian war and the extreme heat waves of Summer 2022 as a case study. Four(4) war scenarios are considered such as the invasion phase, the peak of the war, Ukraine's resistance, sanctions against Russia, and refugee crises in Europe. Using data from the US Department of Agriculture (USDA), Statista, WITS, and Acclimate production value losses. Results show that the agricultural sectors of southern European countries such as France, Italy, and Spain were most affected by the extreme events, although the direct impact of refugees was lower compared to their northern counterparts. Strict sanctions against Russia coupled with Ukraine's resistance will benefit EU food markets, but at the same time the agricultural sectors of smaller nations and weaker economies, particularly those of Russia's allies, will be highly vulnerable. We suggest that their impact on weak economies should not be overlooked when developing and adopting conflict resolution measures.