A Simulation Model for Historical Evolution of Geopolitical Entities

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For a long time, modeling the long-term evolution of territorial extent in geopolitical entities was limited by the lack of systematic and comparable data. The release of the Cliopatria database has largely overcome this limitation by providing a global geospatial encoding of political entities over time, from which annual time series of territorial extent can be derived for a large number of historical polities.

This new empirical availability makes it possible to move beyond case-specific explanations and to investigate whether generic dynamical patterns emerge when territorial dynamics are considered at an aggregate level. In this perspective, individual historical trajectories are not interpreted as objects to be reproduced in detail, but as realizations of an underlying generative process, without making assumptions about the specific historical mechanisms driving territorial change.

Accordingly, this work proposes a simple stochastic generative model for historical territorial time series, with the aim of assessing whether a minimal dynamical framework is sufficient to generate ensembles of trajectories whose overall shapes and aggregate statistical properties resemble those observed in empirical data.

Model validation is carried out by comparing both the temporal evolution of empirical time series with those generated by the model, as well as the distributions of key properties—territorial area, mean area, and duration—in order to assess whether similar statistical behaviours emerge.

Rather than forecasting specific trajectories or providing causal explanations for individual historical cases, the model is intended to capture salient statistical features of territorial dynamics. Its results suggest that the trajectories of historical entities' areas are the consequence of two coexisting regimes of change: frequent variations of small magnitude and rarer shocks of much larger amplitude.

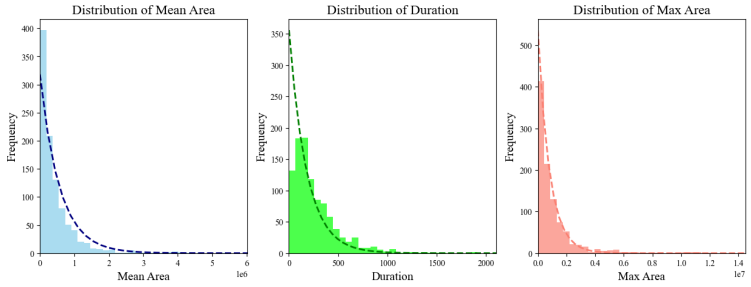


Figure 1: Comparison between empirical data and simulated distributions of territorial time series statistics. Histograms represent the distributions obtained from simulated time series generated by the model. Dashed lines indicate the best-fitting distributions estimated from the empirical data. Panels show, from left to right, the distributions of mean territorial area, duration, and maximum territorial area.