

Title: What causes irregularities in the structure of Numerals?

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Keywords: numerals, regularity, borrowing, phylogenetics, processing effort

Numerals in the world's languages exhibit variations in both structure and meaning. Past studies have uncovered several reasons influencing their origin, variety, and similarities. Among the leading factors are borrowing, diverse counting resources and practices, processing effort, language-internal constraints such as word order, ecological factors, as well as taboos. To date, no study has quantified the combined effects of these elements on the emergence and elaboration of numeral systems over time, due to the lack of comprehensive synchronic and diachronic data and robust statistical methods. This study examines the impact of five of these elements on numeral systems of Kwa and Atlantic languages using a co-evolutionary Bayesian Continuous-Time Markov Chain model, a phylogenetic approach, and agent-based modeling. Preliminary results show that the resources for representing and manipulating numbers, along with contact-induced changes, are the main sources of irregularities. The dominant regular structures are products of optimizations, manifesting as efficiency in processing along with constraints from the linguistic structure.

Acknowledgement: This work is part of the ERC-funded Synergy project QUANTA. I am grateful for the funding and the valuable discussions at QUANTA workshops.