Necessary Conditions: Theory, Methodology, and Applications. Edited by Gary Goertz and Harvey Starr. (Rowman and Littlefield, 2003.)

The editors and contributors of this book cogently demonstrate how the fairly simple looking and often misunderstood concept of necessary conditions can generate various intriguing methodological and theoretical consequences for social science research—regardless of the method used and the research topic studied. This book engages everybody in critical self-reflection by showing that—contrary to widespread belief—necessary conditions are not rare in social science theorizing (Goertz in Chapter 4 alone counts more than 150 in the social science literature of the last three decades); they do not imply a deterministic notion of causality which by some is deemed alien to modern social sciences; they do not inevitably require the use of dichotomous data; they do not have to be spurious or trivial; and they are currently not adequately dealt with in research based on standard statistical practices, primarily because the notion of correlation—the cornerstone of most quantitative statistical analyses—is inappropriate for investigating statements of necessity.

This book deserves special credit for not just opening a Pandora's Box but giving hints at how to close it by outlining novel statistical procedures designed for analyzing necessary conditions that incorporate the rich and decades-old body of literature on probability theory and statistical tests. This anthology should appeal to scholars from all methodological schools and puts pressure on us all, for after this book nobody can claim not to know about the theoretical importance and methodological intricacies of necessary conditions and how to methodologically tackle that complexity.

Almost in passing, this book offers thought-provoking insights in universal research design issues such as case selection, scope conditions, and model specification. For instance, various authors (notably Most and Starr in Chapter 2) convincingly show that, contrary to standard advice to graduate students, we not only should select cases on the dependent variable, but also ensure there is little or no variation on it. If necessary condition hypotheses are tested, such case selection is a logical must.

By thoroughly spelling out the different aspects of the logic of necessary conditions, this book shows that, currently, on the one hand, some scholars say necessary condition but don't mean it, while on the other hand, many people mean necessary conditions but don't say it. That is bad for social science research because it means we are likely to test our theories with inappropriate methods.

The 13 chapters are a refreshing mix of abstract methodological reflections, hands-on suggestions, and real-life research applications. The introductory chapter by Goertz and Starr does a marvelous job of systematizing the debate on the wide array of issues discussed in this book. It helps to better understand how the different contributions covering very different topics and methods speak to each other and why they are relevant for understanding necessary condition theory, methodology, and application.

Based on their carefully developed argument that there are "various interpretations of the necessary condition concept" (see especially page 12; Table 1.1), Goertz and Starr pave the way for a methodological pluralism in dealing with necessary conditions in the social sciences. Most importantly for quantitative scholars, the data can be continuous rather than just dichotomous and the hypothesized necessary condition relationship can be of probabilistic rather than just deterministic nature. None of these

concepts can claim to be the true concept of necessary conditions. While interlinked, all highlight different aspects and all are based in different schools of thought: mathematical and philosophical logic, (fuzzy) set theory, calculus, and probability theory. The message that there is more than one way of thinking about necessary conditions is not to be confused with an "anything goes" attitude. Rather, this book shows that each conception of necessary conditions comes with a set of specific rules how to correctly test them.

Levy's chapter on the process leading to the outbreak of WWI exemplifies the claim that case studies show a strong affinity to the language of necessary conditions. What could have been highlighted more is that the plausibility of necessary conditions in case studies rests upon the plausibility of the counterfactual arguments put forward. This reliance on counterfactuals sets case study approaches to necessity apart from large(r) N tests of necessary conditions, which are based on empirical distributions of cases, as demonstrated in the chapters by Braumoeller and Goertz, Dion, Ragin, and Tsebelis.

Not all cases matter in statistical tests of necessity, though, and including them—as most common measures of association, such as chi-square, gamma, or tau-beta, do—generates flawed results. This is probably the book's most forceful and consequential deconstruction of "standard statistical reflexes" (197) when approaching necessary condition hypotheses. For example, the hypothesis "rich cases are democratic" might sound similar but is utterly different from "the richer a case the more democratic it is." The first postulates an asymmetric set relation (democraticness is claimed to be necessary for richness, or, richness sufficient for democraticness, respectively) and the second a symmetric correlation between the variables "richness" and "democraticness." The necessity (or sufficiency) statement would be confirmed if a triangular heteroskedastic

pattern was found in the data whereas the correlational statement expects us to find homoskedasticity with most cases on or close to the regression line. In short: "necessary condition does not equal correlation" (48). Unsurprisingly, this implies severe limitations to dealing with necessary condition within the framework of correlation-based standard statistical techniques. Tsebelis (Chapter 11) makes an innovative attempt at combining familiar statistical tools but truly adequate statistical procedures for dealing with necessity are probably more complex and break more radically with common statistical practices. This is the message one gets from reading Braumoeller's and Goertz' ideas in Chapter 9.

The above example showing that set relations and covariations are different raises an important question that remains somewhat unresolved in the book. How should one overcome the tension between the verbal formulation of a necessary condition hypotheses framed in terms of sets, or, types of cases (e.g., "rich" vs. "not rich"), on the one hand, and empirical tests based on continuous data? By definition, with a continuous measure there is no clearly specified level at which cases are "rich" or "not rich." This is problematic because all of the most thought-provoking arguments in this book—select on the DV and have no variation, do not use information in the 0,0 cell of a 2x2 table, do not use standard measures of associations—rest on the notion that the scales for measuring the condition and the outcome have a starting and an endpoint with distinct qualitative meanings. This is not a plea for limiting necessary condition hypothesis testing to (crisp or fuzzy) set theoretic approaches, but more research needs to be done how these well-grounded criticisms of today's research approaches to testing verbally formulated

necessary condition hypotheses translate once necessity (and sufficiency) are analyzed with continuous data void of any set-theoretic meaning.

A book opening up and partially closing so many fundamental research methodological issues should probably not be criticized for what has not been addressed. What is more, since its publication some of the issues left open have by now been covered (with active contributions by some of the editors and contributors of the book), such as coefficients expressing the empirical consistency and relevance of necessary (and also sufficient) conditions (Goertz 2006a; Ragin 2006), software packages for dealing with necessary (and also sufficient) conditions based on data expressing set membership (Ragin, Drass, and Davey 2006), advancements in set membership calibration based on raw data (Ragin N.d.), systematic treatments of necessary conditions not just in causal inference but also in concept formation (Goertz 2006b), and specifications of the role of counterfactuals for assessing necessary conditions in case studies (Goertz and Levy 2007).

Thus, the following reads more like a wish-list of topics the authors hopefully will write their next book(s) on: Sufficient conditions are mentioned throughout the book but their implications for social science theory and practice are not dealt with systematically. The prevailing standpoint in this book is that, mathematically and logically speaking, necessity can easily be transformed into sufficiency. Such a prevalence of pure formal logical laws over social scientific reasoning is not fully satisfying. It makes a big difference for theoretical and research design choices whether one analyzes necessary conditions for, say, democracy, as opposed to sufficient conditions for nondemocracy (Harvey in Chapter 7 demonstrates this forcefully). Furthermore, as Cioffi-Revilla in his

very nice concluding chapter points out, paying attention to both necessary and sufficient conditions is quite natural and ultimately more insightful (297). There is, however, also no doubt that bringing sufficiency on board adds yet another level of complexity to social science theory and methodology, as one has to simultaneously cope with issues of equifinality (different conditions lead to same outcome), multifinality (same condition leads to different outcomes), conjunctural causation (combinations of conditions lead to outcome), asymmetric relations (occurrence and nonoccurrence of outcome require separate analyses and explanations), and INUS conditions. Braumoeller (2003) makes some valuable suggestions on how to deal with all these issues within a statistical framework but more needs to be written on how to handle that complexity within the quantitative—but also the qualitative—research template, especially if the so far fairly neglected time dimension (plus timing and sequencing) is added to the notion of causal complexity in terms of necessity and sufficiency.

All contributors to this book deserve praise for presenting difficult methodological issues in a clear and understandable way. Such clarity is a necessary condition for further progress in this important area of research. By doing such a wonderful job in terms of clarity and readability, the editors certainly prove themselves wrong with their hunch that their book, by showing the intricacies of necessary condition hypotheses, might lead to "an increased hesitance in proclaiming necessary condition hypotheses" (22). Instead, it stimulates interest in necessary conditions and definitely helps to get tests of necessity right, no matter in which research tradition these tests are grounded.

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