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BOOK REVIEWS

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Emmanuel Lazega, Tom A. B. Snijders, eds., *Multilevel Network Analysis for the Social Sciences: Theory, Methods and Applications*, Heidelberg-New-York-Dordrecht-London, Springer, 2016, 376 p.

This work describes quantitative analysis of several types of groups of individuals, presenting it as complementary to multilevel analysis. It offers a complete review of advances in this highly productive area and an analysis of the role of social networks in collective action.

The first section, on theory, explains how the multilevel approach as initially developed in the social sciences by Goldstein (1995)[(1)] is complementary to social network analysis, first developed by Wasserman and Faust (1995),[(2)] where the aim is to discover the processes and systems of social interdependencies operative in social networks. Multilevel analysis is an original synthesis of holism and methodological individualism that can be used to explain individual behaviour in terms of various individual characteristics and characteristics of the groups that individual is linked to (family, organization, contact network, etc.). Though multilevel analysis takes into account the effects of the various aggregate levels on behaviour, it cannot be used to study behaviours specific to each level or complex inter-level interactions. Only the second approach – network analysis – can take into account the system of interdependencies within which individuals operate and so grasp the full complexity of social networks. Social context here is no longer an exogenous factor as in multilevel analysis but is instead generated by the social processes that the various actors set in motion or engage in. The task of multilevel network analysis, then, is to move from local structures and processes to an all-encompassing network by taking into account interdependencies and the structural effects generated.

Discussing the theoretical grounding of this undertaking leads in several ways to presenting methods, the subject of Part II. Agneessens and Koskinen work to explain differences in individual behaviours and attitudes using a Multilevel Social Influence (MSI) model that accounts for both the individual's position in the network and the influence of network structure at the higher aggregate level. As the authors explain, "The complex interdependence of social networks makes the models more complicated, as there is a need to control for both [individual and network] levels as well as for social contagion and autocorrelation" (p. 5), referring to the influence of other individuals in the same group.

The second chapter, by Tranmer and Lazega, generalizes standard multilevel models so as to account for dependencies among networks located at different levels; e.g., to show how an inter-individual network of personal relations and an inter-organizational network may affect each other. The authors show that these problems can be properly dealt with using multiple membership multiple

(1) H. Goldstein, 1995, *Multilevel Statistical Models*, London, Edward Arnold, 178 p.

(2) S. Wasserman, K. Faust, 1995, *Social Network Analysis: Methods and Applications*, New York, Cambridge, Cambridge University Press, 857 p.

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classification (MMMC) models, where the same individuals belong to different groups.

Wang, Robins and Matous present a statistical framework called Exponential Random Graph models (ERGM) that can be used to apprehend a complex multilevel structure by way of simpler configurations, a means of discovering the impact of local configurations in the emergence of the structure as a whole.

Zhu, Kuskova, Wasserman and Contractor expand correspondence analysis to incorporate multiple relations and attributes operative at both the individual and higher aggregate levels. These techniques, more exploratory than the preceding ones, provide precious assistance in graphical exploration and in specifying theoretical hypotheses.

In the last chapter in this section, Žiberna and Lazega determine groupings of individuals and their most relevant ties as a function of any and all available information, using what is called multilevel blockmodeling. The various classification methods presented shed light on different features of social networks.

Part III then presents detailed applications of this approach to a number of cases: research networks and interactions between laboratories, networks of firms on economic markets, networks developed or reactivated at international trade fairs, multilateral treaties (here in the fishing sector); and knowledge sharing in organizations.

But the book not only presents methods applications; it analyses them critically while explaining how they can be used to resolve major social science problems. The fundamental question is, does the social structure we live in affect our individual behaviours and outcomes and if so, how is that structure manifest? Many researchers think that macroscopic regularities can be explained entirely by the rules underlying individual behaviour. But that approach, often implemented through agent-based modelling, cannot enlighten us on how analysis at the individual level may contradict analysis at an aggregate level.(3) This book clearly shows how that influence appears and how it can be used to analyse both the internal structure of the many groups each individual is connected to and the complex ties that may exist between them. It is regrettable, however, that in most of the research presented there is a greater concern to explain network structure than to use that structure to explain actors' individual behaviours. And much more work has to be done if we wish to understand how changes that occur at each aggregate level cause the other levels to evolve and change. But such analysis is complex, which in turn explains the pronounced heterogeneity of the methods presented: their diversity reflects the complexity of inter-individual interdependencies (family-related, economic, political and cultural), which in turn can only be apprehended and analysed conjointly using a variety of tools.

Last, we may have expected that given the relatively small size of the observed

(3) D. Courgeau, 2007, *Multilevel Synthesis. From the Group to the Individual*, Dordrecht, Springer, 228 p. Originally published as *Du groupe à l'individu. Synthèse multiniveau*, Paris, INED, 242 p.

groups and the complex interdependencies between the different levels, the work would have favoured a Bayesian approach, where all parameters are random variables, over the frequentist approach, where they are fixed quantities. While a number of chapters do use the Bayesian approach, others use the frequentist one and still others apply empirical Bayesian estimation where the data is used to estimate an a priori distribution. According to Greenland,(4) the multilevel approach unifies apparently disparate frequentist and Bayesian methods and generates better ones: empirical Bayesian methods. It is important to mention this debate, though longer discussion of it is beyond the scope of this review.

Multilevel Network Analysis is a crucial reference for all social science researchers, particularly demographers. It comprehensively presents the most recent advances in multilevel analysis of networks and analysis of multilevel networks (Snijders' excellent formula), together with useful methods and fascinating applications of them.

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(4) S. Greenland, 2000, "Principles of multilevel modeling," *International Journal of Epidemiology*, 29(1), pp. 158-167.