

## PREFACE

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Space is an essential part of human experience: along with time it frames events, since everything that happens happens *somewhere* in space and time. The power of science lies in its ability to discover general truths that are independent of space and time, and can therefore be expressed economically, and applied anywhere, at any time, to solve problems of human importance. So it is not at all obvious that space is important to science, except as a complication to be removed during the process of generalization.

This book is about advances in spatial econometrics, a discipline founded on the principle that space *is* important to our understanding of economic and other social processes operating in human societies, distributed over the surface of the Earth. It has strong links with the older disciplines of geography and regional science, and of course economics. It takes a quantitative approach, modeling the interactions that occur across space and that influence economies, labor markets, housing markets, and a myriad of forms of economic and social activity. Spatial variables such as distance appear explicitly in spatial econometric models, to capture these interactions and their response to location. Space is thus an inherent part of the scientific generalizations that result from spatial econometric analysis, but in an abstracted form, typically as a matrix of interactions  $W$ , rather than as locations *per se*. Such models are therefore invariant under a range of spatial operations, including rotation, translation, and inversion. The interaction matrix captures *relative* location only, *absolute* location being irrelevant to most spatial econometric theory.

Two arguments underlie this approach, the first behavioral and the second artifactual. Human societies interact in numerous ways, through migration, journeys to work, telephone and mail communication, transportation of goods, and flows of information. In all of these forms interaction tends to react to distance, because interaction cost is a function of distance, or because human acquaintance networks depend in part on face-to-face contact, or because it takes time to overcome distance. Thus space, in the form of distance, becomes a direct causal factor in processes that are impacted by interaction. Recently, of course, there has been much speculation over the distance-conquering effects of the Internet on flows of information.

The second argument results from the tendency of human societies to impose largely arbitrary boundaries on what is in many respects a continuous surface, in part to preserve confidentiality, and in part for economy. Statistical reporting agencies assemble data for bounded zones, masking within-zone variation, and limiting social scientists to the study of between-zone variation. This would be fine if zones behaved as independent social aggregates, but of course they do not; if there are such things as independent social aggregates on the Earth's surface, they are almost certainly cut frequently by zone boundaries. Thus models must include space, again in the form of a matrix of

interactions, to deal with what is in essence an inability of data-gathering practice to provide data in a theoretically coherent form.

Over the past three decades spatial econometrics has advanced from a fringe scientific activity to the status of a fledgling discipline. Many of its leaders are represented in the pages of this book, and almost all are cited. The book comes at a time when space is more important than ever in social science, not only for the reasons cited above, but also because of the dramatic increase in recent years in the supply of spatially referenced data; the widespread adoption of geographic information systems (GIS) and other software for handling spatial data and for performing spatial analysis and modeling; and the increasing pressure on science to deliver results that are readily incorporated into policy. The book is a welcome addition to the literature, providing a single source for the most important recent work in the field.

The Center for Spatially Integrated Social Science (CSISS) was funded in 1999 by the U.S. National Science Foundation to improve the research infrastructure for spatial analysis and modeling in the social and behavioral sciences. The arguments for CSISS, including those already outlined above, are elaborated by Goodchild *et al.* (2000). CSISS sponsors seven programs, including the development of tools for analysis and modeling; full descriptions can be found on the Center's website, <http://CSISS.org>. As Director of CSISS, I am honored to contribute this preface, and I welcome the book as an important product of the Center's work and as a significant contribution to the field.

Goodchild MF, Anselin L, Appelbaum RP, Harthorn BH, 2000. Toward spatially integrated social science. *International Regional Science Review* 23(2): 139-159.