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John R. Roy

Spatial Interaction Modelling

A Regional Science Context

With 7 Figures
and 1 Table



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Dr. John R. Roy
Environmental, Transport and Urban Development Studies (ETUDES)
PO Box 96, Mallacoota
Victoria, 3892
Australia
johnmall@bigpond.com

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Preface

Spatial interaction modelling has a long tradition, especially in geography, where it was introduced as 'gravity' modelling in the early part of last century. The key purpose of such models is to determine the influence of 'spatial separation' between origins and destinations on either locational or travel choices of firms and individuals. By the 60's, statistical concepts, also used in physics, had been introduced to give the models a stronger methodological basis. However, it was not until the early 90's that these models were put into a more formal probabilistic framework, being potentially opened up as most-probable-state models to be used in conjunction with any theory underlying the analysis at hand.

Within this overall development, my particular niche, explored fully in this book, is to relate spatial interaction modelling to regional science, especially to spatial economics. In this continuing endeavour, there are four colleagues to whom I owe the most. The first is Paul Lesse, a former colleague from the then Division of Building Research, Commonwealth Scientific and Research Organisation (CSIRO), Australia. His strong mathematics/physics background allowed us to understand entropy within a very generalised framework, especially in terms of relevant transformations of the conventional entropy objective functions. As the 'actors' being modelled in spatial interaction models are in many cases 'economic' actors, workers in this field are inevitably confronted with acquiring a knowledge of spatial economics, even if, as with myself, this is not one's original discipline. For this daunting task, I needed one or two key colleagues with not only the virtue of patience, but possessing flexible and open minds, the key quality which regional scientists strive for. I have been very fortunate to have collaborated with two key guys who need no further introduction here, Börje Johansson and Geoffrey Hewings. With Börje, I was gently led into coming to terms with abstruse concepts such as 'utility', supply and demand, existence of equilibria and, finally, imperfect competition. Fortified by many glasses of Australian red wine, which Geoff had miraculously unearthed in the Urbana of the early 80's, I was introduced to the concept of Regional Science, as well as to the manifold variations and subtleties in regional input-output analysis, which have fascinated me ever since. If there is any colleague whose collaboration would have made this book much more rigorous, it must be Tony Smith, originally from the Regional Science Faculty, University of Pennsylvania. Tony's work has been a continual fount of inspiration to me, stimulating the development

of key concepts of the unifying regional science framework for spatial interaction modelling, which is the book's key focus.

I was fortunate that John Brotchie, head of our former group at CSIRO, which also included Paul Lesse and David Batten, was vitally interested in extending the understanding of entropy models and their links with models based on utility concepts. John's successor, Peter Newton, continued support for this work. Nariida Smith, the leader of the CSIRO planning project within the group, encourages this modelling work wherever possible. I would also like to thank Hideo Nakamura and Yoshitsugu Hayashi from Japan, who invited me to spend a year at University of Tokyo in 1994-95, where I was able to meet many innovative regional scientists, including Takeo Ihara, Kiyoshi Kobayashi, Kazu Miyamoto, Hisa Morisugi and Takayuki Ueda, to name but a few. The broad multi-disciplinary focus of my Japanese colleagues, many of whom, like me, had civil engineering as their original field, was a great encouragement. Collaboration with Francisco Martinez, University of Chile, has been both inspiring and productive, yielding most of the content of the housing chapter in this book. There are many other colleagues whose work has influenced me strongly. Among these, I would like to highlight Åke Andersson, Martin Beckmann, Dave Boyce, Stewart Fotheringham, Masahisa Fujita, Britton Harris, Folke Snickars, Jean-Claude Thill, Huw Williams, Alan Wilson, and the late Giorgio Leonardi. All these scholars have been a source of inspiration and a cause for thanks - perceived limitations in my own work should not be ascribed to any of them! Regional science requires *par excellence* a multi-disciplinary perspective, in a context where most of us inevitably have one discipline further developed than others. This fact implies that open collaboration, freed from the often unspoken or unrecognised assumptions of a particular discipline, can be especially productive. *Vive la difference!*

Mallacoota, Australia, in September 2003

John R. Roy

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