

## Book Review for Economic Geography

*Transportation Networks and the Optimal Location of Human Activities: A Numerical Geography Approach.* By I. Thomas. Northampton, Massachusetts: Edward Elgar, 2002.

*Transportation Networks and the Optimal Location of Human Activities* is based on previous work by Thomas and her colleagues located in various journals and what she identifies as the equivalent to a second doctoral dissertation. Therefore, the book is in essence a series of related papers, which extend each other by relaxing one constraint or another. Though not really written for the beginner, tacit knowledge required includes optimization and basic network analysis, the book may be suitable as a text used (with others) for advanced graduate students. The intended audience is clearly researchers and students of the location-allocation problem – where facilities should be sited on networks, and how many facilities are required.

To begin, the book includes an extensive and valuable historical review of the location-allocation problem, including literature in the French language often not accessible to English-speaking researchers. What is most interesting about the book is its systematic treatment of alternative network topologies on the location-allocation problem. This begins in Chapter 3 “Optimal locations and transportation networks: the case of autarky”, which presents and tests the basic model using toy networks. The optimal location of facilities depends on whether a network is a grid, a radial, or a ring-radial structure, and on how far out is the ring-road. This is not surprising, but is worth documenting. Future research simultaneously locating point-facilities and networks (combining the location-allocation problem with the network design problem in some fashion) would then give us the “optimal” urban form, at least with respect to public welfare. Thomas consciously shies from drawing conclusions about optimal networks, and doesn’t explicitly provide the tools for the less shy reader to draw those conclusions (an overall social welfare index). However, by comparing the average distances associated with particular networks, with number of links (and by her gridded geometry - link distance) (presumably correlated with network cost), the research allows the reader to draw the conclusions. To do so, the reader must weigh largely fixed infrastructure cost and ongoing network distance (between nodes and located facilities). Inspection suggests that the ring-radial network meets trade-off best, but some further development in this area would be welcome.

Another intriguing chapter is Chapter 9 “Optimal locations of health centres in Niger: rainy season versus dry season accessibility”, which applies a model to a real case; with the wrinkle that transportation costs vary seasonally (suggesting the best facility locations in one season differ from another). It is somewhat frustrating that the practical applications, which illustrate the value of the approach, are so far in the back of the book. The application chapters can be read independently of the analysis using toy networks.

A notable feature of the book is the relative lack of equations. Aside from formulating the optimization problem near the beginning of each chapter, the results are presented. There are no detailed proofs or formulations of the methods of solving the optimization problem. In a sense, the methodology is missing. The author is claiming: I solved an optimization problem that gave me this unique solution. There is no evidence presented that the solutions are unique, and the author notes that some are local optima. Some additional detail, presented in an appendix, may have been useful for readers

inclined in that direction. However, the lack of equations keeps the more qualitative reader from being distracted or losing interest. (It has been said that each equation loses half your readers, in that respect, the author will retain about half her readers in most chapters).

The book, and the location-allocation problem in general, suffer from a preoccupation with idealized command-and-control governance. Rarely is a blank slate provided. The book solves optimization problems (referred to as simulations) – to find a static equilibrium. Admittedly this is a tractable problem. In their general form, these problems assume all locations for our public facilities can be simultaneously moved, rather than optimizing subject to historical path-dependence (I had 11 facilities, they (or most of them) need to stay, where should I put number 12, 13, ...), which is how most public facilities really need to be located. The problem also assumes an omniscient central planner locating facilities, rather than a group of separate decision makers inter-dependently locating competing facilities. This is true for a class of problems in every society, regardless of the degree of centralization. McDonald's, a capitalist icon, faces the same problems in restaurant locations, doing so centrally. However it does do so sequentially, and while it can sometimes take down failing locations, the fixed costs of location would have to be duplicated. An incrementalist, dynamic approach, incorporating the ideas of game theory, would increase the value of the problem in future applications, and is the direction I believe that research in general should head.

The book is similar in some respects to the methods that Stephen Wolfram proposes in the widely publicized *A New Kind of Science*, both books contain many graphs presented which show the resulting solutions. However it could fall prey to the same criticisms leveled at Wolfram's text (though certainly not the critique of his arrogance, Thomas is modest in her claims). I had a professor once say to me "a monkey can do simulations". The key, perhaps to being a researcher rather than a monkey, is to formulate the problem well. Thomas is clear on her formulation. Though I have used simulation myself in a number of cases, it is important to couple simulation with hypothesis and analysis. While there is extensive reporting of results, it remains a challenge of this line of research to generate general conclusions, or robust predictive models that can be used in the absence of simulation.

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