The MAUP manifests itself because spatial data collected at a fine resolution (such as census data by household) is reported at coarser resolutions (such as census enumeration areas or tracts) due to requirements of confidentiality or ease of storage and manipulation. Values of statistics like correlation coefficients and variances differ depending on the spatial resolution of the aggregation because information on variability is lost (the scale effect) and also on how the boundaries of the aggregated regions are selected (the zoning effect). Hence, values of statistics computed on an aggregated dataset will not be the same as the desired (and unknown) "true" values at the highest scale of resolution, although this has not stopped many researchers from computing them anyway.

The empirical goal of research into the problem, as I see it, is not to "find a problem for which reaggregations do not wreak havoc on standard descriptive statistics" (p. 250), but rather to find a way to study how the process of aggregation that produced the dataset affects the statistics computed from it, so that one can obtain more accurate estimates of the true values of the statistics. Aside from the weighted mean, no statistic in common use is aggregation invariant, nor is it likely that any can be found, given the loss of information that occurs when several numbers are averaged (or summed) into one. The title of section 14.1.2 should be revised to reflect the contents, which demonstrate that King's method for ecological inference is only slightly affected by the MAUP, but is not a solution for it.

Aside from this quibble, this book represents an important step forward in the quest for a solution to a troublesome problem in analysis. Geographers and others will find it a useful reference about the ecological inference problem and for the methods to solve it. The potential usefulness of the method means that it will be tested rigorously in the years to come, and if it holds up then it is highly likely that King's method will replace Goodman's regression as the standard tool for ecological inference.

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Mathematical Location and Land Use Theory, by Tönu Puu. 1997. Advances in Spatial Science Series. Berlin and New York: Springer. 294 + ix. DM140.

There is recent recognition of the importance of geographical space in economics. Geographical conditions, such as the meeting of a river and an ocean, or proximity to the rest of a state or country, are at least as important as classical economic conditions, such as comparative cost advantages. A textbook of the classical models and basic techniques of spatial economics with an explicit treatment of geographical space is welcome indeed. The classical models introduced by Puu are Weber's location model, Beckmann's commodity flow model, Lösch's market area model, Von Thünen's land use model, gravity models, and spatial business cycle models. This broad array of rather disparate models is treated in a surprisingly unified and pedagogical manner.

The organizing principle is the minimization of total transportation cost. The basic techniques are vector analysis, Euler's equations, the transversality principle, and structural stability analysis. The introduction is intuitive, linked to the presentation of the various models. Puu is a good story teller and does not annoy the student with theorems and proofs. Personally, I find this style pleasant, but I happen to be knowledgeable of the material, whereas the book is addressed to students without such prior knowledge, except possibly of calculus and microeconomics. I am afraid that the new tools will not stick. The treatment is too sketchy.

What worries me even more, is that Puu allows this approach in his own research as well. There is no clear distinction between exogenous and endogenous variables. He presents a model and then, halfway through the analysis, makes assumptions on variables that are determined by the model. For example, the main model in the book is Beckmann's flow model, which is easy to write down. For simplicity, I let the geography be only one-dimensional (like Hotelling's beach) and set transportation cost equal to unity (per unit of distance). The commodity flow at location x is denoted $\varphi(x)$. It may be tapped by local excess demand, $z(x)$. The material balance is $d\varphi/dx + z(x) = 0$. Total transportation cost is $\int|\varphi|$. The issue, then, is to determine the commodity flow, φ, that minimizes total transportation cost given excess demand, z, subject to the material balance. Puu derives Beckmann's first-order conditions, involving the shadow price of the constraint, that is the commodity price. Fine, but this price is endogenous. In various places in the book (p. 94, p. 151 and p. 239), however, he makes assumptions on excess demand as a function of price, like decreasingness. This is verboten. Excess demand z is exogenous. Flow φ is endogenous. Lagrange multiplier λ is an intermediate construct, hence also endogenous. It remains to be seen if there is a decreasing relationship.

Now an interesting contribution of the book claims that the solution to Beckmann's model is unique. The proof, however, *assumes* that excess demand is a decreasing function of price. Excess demand, however, is not a function of price in this model, and the confusion is serious. In fact, the claim of uniqueness is false. A counterexample is as follows. Let location $-1 \le x \le 1$, Hotelling's beach, and excess demand $z = \delta$, the unit mass distribution, concentrated in the origin. Then the problem is to minimize $\int_{-1}^{1}|\varphi|$ subject to $\varphi' + \delta = 0$. By the constraint, φ is constant on $-1 \le x < 0$, say L, and φ is $L-1$ on $0 < x \le 1$. Substituting, the problem reduces to the minimization of $|L| + |L-1|$. Any L between zero and one is optimal. This proves that Puu's uniqueness claim is false. (It can be shown that price is pyramid shaped, zero at the borders, and unity in the center, where demand is concentrated. The price gradient reflects transport cost, as should be. Price varies even though excess demand is constant.)

The same methodological flaw plagues Puu's analysis of Von Thünen's land use model. An interesting research agenda would be to endogenize excess demand by deriving it from the fundamentals of the economy, say production and utility functions.

The last part of the book comprises three special topics: traffic distributions, spatial business cycles, and networks. Here the book suffers from the law of diminishing returns. The chapter on traffic distributions is very rudimentary. Gravity and entropy models are not related to utility maximization and the migration model sticks in production as a function of price, adding to the aforementioned confusion. The spatial business cycle model is discussed very loosely, without reference to its Klein-Gordon structure and closed form solution. Similarly, the network analysis merely touches on the first moment of distance distributions.

Puu's introduction to location and land use theory instills a good sense for issues in spatial economics and stimulates one to conceptualize them. In short, it is a pleasure to read. I am afraid, however, that the analysis neither sticks with students nor convinces theorists.

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