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**Review of Suzuki and Nijkamp': "Regional Performance Measurement and Improvement: New Developments and Applications of Data Envelopment Analysis"**

Soushi Suzuki and Peter Nijkamp  
Springer, Singapore, 2017  
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The book, published as part of the New Frontiers in Regional Science: Asian perspectives, sets out to provide a self-contained state-of-the-art overview of Data Envelopment Analysis (DEA); and illustrates the use of DEA to regional scientists through a range of applications to Japanese regions. In brief, as I shall explain, Suzuki & Nijkamp achieve just that. Moreover, an additional benefit of a self-contained succinct volume like this is that it offers regional scientists an accessible overview of the methodology of DEA.

The book is composed of 13 chapters and divided into two sections. Part 1 provides an overview of DEA and its various extensions as relevant for regional scientists. Part II contains 7 chapters, each of which demonstrates the application of DEA to a particular efficiency study: local government finance; public transport; global cities; emissions from energy generation; and energy-economy-environment trade-offs. Furthermore, an appendix provides an introduction to spreadsheet based DEA solver published online by Suzuki and Nijkamp: <http://www.lst.hokkai-s-u.ac.jp/~soushi-s/DFM-Solver.html> The application chapters make this book particularly relevant for regional scientists as they illustrate the use of DEA at different units of analyses, from an organisation, to the city and regional levels and the national level. Moreover, these chapters provide useful pedagogic support, which should increase the appeal of this book to both practitioners and students.

The authors motivate the relevance of DEA with reference to historical trends in economic development, moving from a period of growth in population, economic output and emissions in the 20<sup>th</sup> and early 21<sup>st</sup> centuries to a future where population decline is projected, reduction of greenhouse gas emissions is an urgency and it is a priori unclear how these trends will affect economic output. The authors argue that this context requires an emphasis on efficiency analyses, which will place increased importance on DEA within the regional scientist's methodological arsenal. Couldn't agree more! Perhaps with tongue in cheek, the authors moreover imply that the converse applies to various well-known evaluation analytical techniques, such as input-output analysis, shift-share and multiple regression techniques. This argument rests on the notion that these techniques evolved from the study of expanding regional economies and is not very convincing.

Whilst, providing an excellent self-contained discussion of the application of DEA at the regional level, reading the book prompts the question of how DEA can best be deployed as part of the arsenal of regional science methodologies. This is not discussed in the book, but is hopefully one that will be

subsequently addressed, as DEA is likely to be a complement to a range of techniques in regional science rather than a substitute. If Suzuki and Nijkamp are planning a second edition, I hope they consider discussing this issue in an additional chapter.

A key strength of the DEA approach is doesn't require the specification of a production technology. However, at the regional level the cost of this simplicity is non-negligible. When applied at aggregate spatial scales the omission of production technology also means that we fail to observe interdependencies over space and time, as well as between sectors. When analysing regions with evolving fundamentals in terms of population, economy and environment, it is not clear how much relevance can be gleamed from a snap-shot analysis of efficiency. I suspect that for many regional scientists used to thinking about economies in general equilibrium terms, this can detract from the appeal of DEA approach. It would have been useful if the book took a more pro-active stance addressing the concerns of potential sceptics. Another note to keep in mind for subsequent editions!

Changes in efficiency do not occur in isolation but will have economic repercussions and disparities can in principle be self-reinforcing. For instance, an increase in regional labour productivity, can stimulate a regional economy through a boost in competitiveness, increase in exports and subsequent inwards migration (e.g. Hermannsson et al, 2017). Even in a World of population decline, in principle productivity changes could set in train a reinforcing process where an increase in agglomeration economies at the destination and decrease at the origin pushes inefficient regions further back from the frontier. As this simple example makes clear, it is important to study efficiency in the context of a regional economy embedded within a multi-regional and multi-national economy, to allow for the general equilibrium response of changes in efficiency, which ultimately feed back to impact the originally observed efficiency.

DEA can be useful to compare standalone units, which can be assumed to be too small to impact the overall economy. However, how do you handle feedback and interaction effects? Hopefully the authors will have time to expand on these questions in future work. In the meantime readers can enjoy this accessible and self-contained introduction to the topic of regional application of Data Envelopment Analysis.

#### **References:**

Hermannsson, K., Lecca, P., & Swales, J. K. (2017). How much does a single graduation cohort from further education colleges contribute to an open regional economy?. *Spatial Economic Analysis*, 12(4), 429-451.