1.   Introduction

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The National Interstate Economic Model (NIEMO) used in this book was developed less than a decade ago but built upon a longer heritage of trying to implement a Multi-Regional Input-Output (MRIO) model. This book is dedicated to the memory of Wassily Leontief and Walter Isard who laid out what appeared to be an impossible but intriguing dream. Because of vastly improved databases and an amazing expansion of computer capacity, we believe that we have come close to recognizing their vision. Of course, conceptually we could go further. Rather than NIEMO's 47 sectors x 52 regions, we could proceed to try and model 500+ sectors and 3,000 counties. This is nice to talk about, but of course impossible to do. The matrix would have 2.25 trillion cells, and even with ideal data structures in place would take years for one run. Also, there are no trade flow data at the county level, although the IMPLAN Group is experimenting with the idea. We rely on the Commodity Flow Survey for interstate flows (ORNL, 2000). In other words, our view is that we have achieved the maximum degree of spatial disaggregation available at this time. A next step might be to create a national metropolitan area model involving about 350 metropolitan areas rather than 3,000 counties, but even this step lies in the future.

In addition, we are not going to present an overview of input-output analysis; the second edition of Miller and Blair (2009) gives you everything that you need to know. A book by one of the editors (Richardson, 1972), written over 40 years ago, spells out the spatial disaggregation and remains relatively up to date. Our approach is standard input-output analysis: direct impacts (that is, final demand), indirect impacts (that is, backward linkages) and induced impacts (that is, secondary consumption effects). However, most of our NIEMO studies exclude induced impacts on the grounds that services rarely cross state borders: the one major exception is the Gulf oil spill described in Chapter 9, where intrastate-induced impacts were important and there were also important induced effects among states because of seafood supply substitutions. The major contribution of this book, in our opinion, is the high level of spatial disaggregation.

There are four editors of this book. Richardson, Gordon and Moore have been here from the beginning (Gordon played a major role in the design, interpretation and explanation of almost all the research studies, as mentioned in the individual chapters but declined to be a co-editor). Pan and Park, initially PhD research assistants but now well-established tenured professors, are the technical experts capable of dealing with multi-million cell matrices.

The NIEMO model is described in Chapter 2. Non-technical readers will find the case studies comprehensible and do not need to analyse Chapter 2 in great detail if they are willing to take a leap of faith and trust that the models have sufficient validity.

The early chapters in the book (Chapters 3–6) are about terrorism, typically simulations of exogenous attacks to estimate the business interruption effects. These are much easier to analyse than a real life event, when the shock and endogenous forces become entangled. For example, consider 9/11, which is not in this book (although some of the consequences of an airplane attack are discussed in Chapter 5). How do you separate out the shock from a mild recession that was going on at the time? The recovery was relatively strong and quick, but we do not have a sufficiently spatial disaggregated model of New York and New Jersey to unravel the direct and indirect effects.

Chapters 7 and 8 (which deal with international border closures, as the result of a global pandemic, and foot-and-mouth disease) could be about either terrorist attacks or natural disasters, more likely but not necessarily the latter.

The next chapters of the book (Chapters 9–12) focus on natural disasters (hurricanes, the Gulf oil spill and tornadoes), all of them real ones. This complicates the estimation of direct impacts because of the commingling of exogenous shocks and endogenous events. However, like many counter-terrorist researchers, we began as specialists in natural disasters, and we have grappled with this problem over the years.

Two chapters in the book (Chapters 5 and 6) deal with two non-spatial applications: a man-portable air-defense systems (MANPADS) attack against the US airline fleet and a hypothetical attack on a baseball stadium. Although these chapters are somewhat outside an application of the main model of the book, they illustrate the point that some important policy issues can be analysed non-spatially. The baseball stadium study was in response to a request from the Department of Homeland Security, but it could easily have been an attack on the Los Angeles Coliseum during a University of Southern California football game with a capacity crowd occasionally larger than 100,000; we did not have time to analyse that. As for the major airlines, they have offices and facilities in many

cities in addition to their hubs, so apportioning the direct impacts by state is very difficult, perhaps impossible.

Two penultimate chapters (Chapter 13 on the West Coast ports shutdown of 2002 and Chapter 14 on the extension of the Panama Canal planned for 2015) fall outside the focus of terrorist attacks and natural disasters that dominate the book. However, they are included because their economic impacts are so easily analysed by NIEMO. They illustrate that the model's applications can be so much wider than their terrorism and natural disaster scope. Of course, both are man-made events but neither can be defined as disasters even though some but not all of their economic impacts are negative. In particular, the extension of the Panama Canal is not a zero-sum game.

As our dedication implies, Wassily Leontief and Walter Isard have been inspirational in our research for decades. However, there have been several others who have been influential, and directly helpful. A few of their names include Ben Stevens, Leon Moses, Geoff Hewings, Bill Miernyk, Charlie Tiebout, Bill Beyers, Ron Miller, Karen Polenske, Jean Paelinck, Michael Lahr, Randy Jackson and Jan Oosterhaven.

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