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Frontiers of Input-output Analysis. Edited by Ronald E. Miller, Karen R. Polenske, and Adam Z. Rose. Oxford: Oxford University Press, 1989, 335 pages, \$49.95

Reviewed by Chinkook Lee

Recent years have seen users of input-output (I/O) analysis in empirical research blessed with volumes of new books and a journal emphasizing I/O analysis. Joining this wealth of new material is this volume of selected papers from three conferences held in 1986 commemorating the 50th anniversary of input-output analysis as a new field of economics: the special session honoring Professor Wassily Leontief's contribution to the economics profession at the annual meetings of the American Economic Association held in New Orleans, Louisiana, December 27-30, 1986; the eighth International Conference on Input-Output Techniques, Sapporo, Japan, July 28-August 2, 1986, which highlighted Leontief's contribution to I/O techniques; and the North American meetings of the Regional Science Association in Columbus, Ohio, November 14-16, 1986, in a session marking the 35th anniversary of Walter Isard's application of I/O analysis to regional analysis.

"Many of these papers represent work at the frontiers while others show the broad range of theoretical and empirical input-output research being conducted today" (editor's preface). I found that there are truly some "frontiers" of I/O analysis in this book. For example, the two papers by Klein and Almon use I/O-econometric models to examine industrial impacts of U.S. macroeconomic policies. These two fields of economics, I/O analysis and econometrics, have recently begun to blend after having gone their separate ways for a considerable time. Nobel Laureate Lawrence Klein pioneered large econometric macroeconomic models and has used imbedded I/O models to account for sectoral details and Clapper Almon has developed advanced I/O-econometric forecasting models.

The System of National Accounts (SNA) and Social Accounting Matrix (SAM), described in Polenske's article, also belong to the "frontiers," in my opinion. SNA has been used by the United Nations and many nations, including the United States, since 1972. An SNA-based I/O table is calculated from two separate matrices: the make matrix (industry \times commodity) for the origin of outputs and the use matrix (commodity \times industry) for the use of inputs. An explicit advantage

of the make-use framework is the possibility of a detailed description of secondary production. A SAM, an expansion of I/O accounts, includes distribution of the value added on institutional actors and the expenditure of the latter on final demand. SAM's form an appropriate framework for revealing the structural properties that determine growth and equity performance at different times.

"The Changing Structure of the U.S. Economy," by Blair and Wykoff, establishes its own frontiers. The U.S. economy has undergone a number of significant structural changes over the past decade, yet these changes are not readily apparent from traditional I/O measures, such as the total output multiplier. Blair and Wykoff expose these changes through trends in contribution to total value added (GNP). Whether the effects of changing final demand or changing sectoral production functions are principal factors affecting structural changes has been the subject of intensive studies in recent literature.

It was good to see again an article by Torii of Keio University, Japan. Torii has been a major contributor to the international conferences of I/O techniques, and this time he introduces tariff rates, freight, and insurance rates explicitly into international I/O analysis to examine the effects of tariff reduction in the Asia-Pacific Region. Since construction of empirical I/O tables is time consuming and costly, the accuracy and quality of data are extremely important, so the presentation of how to deal with measurement error and data is welcome. The book also focuses on recent developments in evaluating the accuracy of I/O models in a formal manner.

Parts of the book should have covered a broader range of theoretical and empirical I/O research. Recently, particularly at the ninth International Conference on Input-Output Techniques at Keszthely, Hungary, September 4-10, 1989, topics that appeared, but were not discussed in depth, are discussed extensively in this book. For example, six papers at the Hungary conference explored what to do with negative coefficients in a total requirements matrix when we use commodity technology assumption as a nation adopts an SNA accounting system.

The essays dealing with structural decomposition methods, used by many countries to examine growth and technological changes in their economies, would have benefited by covering more countries where the formal method of structural decomposition is used to analyze the changing pattern of each nation's economy. Six papers at the Ninth I/O conference dealt with this

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issue, particularly participants for countries in Eastern Europe and developing countries

Because this volume is based on papers presented at three conferences, most articles are very short. Therefore, to understand and use the methods presented in this book, the reader may need to supplement with

other references. Overall, however, this volume is a significant addition to existing I/O analysis

Because matters influencing I/O analysis are continuously changing, I would not be surprised to see another volume of new developments in I/O analysis soon. I/O analysis has become an integral and, I hope, permanent part of the economics

The papers include Section I—Input-output and Econometric Models 1 “Econometric Aspects of Input-output Analysis” by Lawrence R. Klein, 2. “Industrial Impacts of Macroeconomic Policies in the INFORUM Model” by Clopper Almon, 3 “Supply Functions in an Input-output Framework” by William Peterson

Section II—Alternative Accounting Frameworks 4 “Historical and New International Perspectives on Input-output Accounts” by Karen R. Polenske, 5 “Descriptive versus Analytical Make-Use Systems: Some Austrian Experiences” by Norbert Rainer, 6 “Toward an Input-output Subsystem for the Information Sector” by Reiner Staglin, 7 “Multiplier Analysis in Social Accounting and Input-output Frameworks: Evidence for Several Countries” by Solomon I. Cohen

Section III—Extended Models and Multiplier Decompositions 8 “Decomposition of Input-output and Economy-Wide Multipliers in a Regional Setting” by Jeffrey I. Round, 9 “The Effects of Household Disaggregation in Extended Input-output Models” by Peter W. J. Batey and Melvyn J. Weeks, 10. “Interrelational Income Distribution Multipliers for the U.S. Economy” by Adam Z. Rose and Paul Beaumont, 11 “Labor Quality and Productivity Growth in the United States: An Input-output Growth-Accounting Framework” by Edward H. Wolff and David R. Howell

Section IV—Regional, Interregional, and International Issues 12 “Effects of Tariff Reduction

on Trade in the Asia-Pacific Region” by Yusuhiko Toru, Seung-Jin Shim, and Yutaka Akiyama, 13 “Structural Change in Interregional Input-output Models: Form and Regional Economic Development Implications” by William Beyers, 14 “Spatial Interaction and Input-output Models: A Dynamic Stochastic Multi-objective Framework” by Peter Nijkamp and Awa Reggiani

Section V—Measurement Error and Data Scarcity 15 “Perspectives on Probabilistic Input-output Analysis” by Randall W. Jackson and Guy R. West, 16 “Qualitative Input-output Analysis” by Ranko Bon, 17 “Error and Sensitivity Input-output Analysis: A New Approach” by Michael Sonis and Geoffrey J. D. Hewings, 18 “On The Comparative Accuracy of RPC Estimating Techniques” by Benjamin H. Stevens, George I. Treyz, and Michael L. Lahr, 19 “Trade-Off between Error and Information in the RAS Procedure” by Janusz Szyrmei

Section VI—Measurement and Implications of Technological Change 20 “An Input-output Approach to Analyzing the Future Economic Implications of Technological Change” by Faye Duchin, 21 “The Changing Structure of the U.S. Economy: An Input-output Analysis” by Peter D. Blair and Andrew W. Wyckoff, 22 “An Input-output Analysis of Technological Changes in the Japanese Economy 1970-1980” by Hideo Kanemitsu and Hiroshi Ohnishi