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tain a rural residence, or meet other personal and financial goals. These findings argue against the common perception that multiple job-holding is a phenomenon based solely on economic hardship. The symbiotic relationship between agriculture and the nonfarm economy is another theme. Many farm families depend heavily on the jobs, business and social services, market outlets, and inputs provided by the nonfarm sector. At the same time, the rural nonfarm sector could not exist without the farming community and its surplus labor, service sector needs, and social and economic institutions. Also, Mary Ahearn and John Lee discuss data limitations and the problems associated with classifying part-time farmers using income-based measures, hour-based measures, or a combination approach. Their definitional and data concerns are echoed as a theme throughout the book.

Research studies examining multiple job-holding in Canada are an asset to the book, demonstrating its similarities to U.S. agriculture. In both Canada and the United States, most farms are private family enterprises, agriculture is highly developed and relatively capital-intensive, multiple job-

holding among farm households is the norm rather than an aberration, resources are mobile between farm and nonfarm sectors, and the farm families' decision to go part-time depends on economic, social, and structural reasons.

The objectives of the book are nicely elucidated, but the rationale is elusive. The authors repeatedly ask, "Why study part-time farmers?" (Barlett), "What are the problems and who cares?" (Carlin and Bentley), and "Are we a conference looking for an objective?" (Hildreth). The repetitiveness of their queries underscores the amorphous nature of multiple job-holding research. Also, readers need help to synthesize the results and conclusions for 21 theoretical and empirical chapters. A concluding chapter that summarized findings and elaborated on future research and policy directions would have been most welcome.

This compendium explores little new ground. Yet, it lays important groundwork for future studies of the causes and consequences of multiple job-holding among farm families, and in this regard, makes an important contribution to the agricultural literature.

Mathematical Programming: Tinker Toys with a Purpose

Economic Logistics: The Optimization of Spatial and Sectoral Resource, Production, and Distribution Systems. By Sten Thore. New York: Quorum Books, 1991, 360 pp., \$49.95.

Reviewed by David Letson

Mathematical programming texts are often heavy on technique but light on synthesis and imagination. Given a menu of model types, readers must discover the usefulness of each. Wading through this sort of presentation can be like reading a dictionary—all parts, no assembly instructions. Such texts are less likely to promote research-bearing economic insight than to provide toys for the academic sandbox. Sten Thore's mathematical programming text is refreshingly different, an engaging presentation of the basic methods, with an important advantage. His synthesis of basic model types also describes the chain of optimization behavior in an economic sector. Far from a cookbook of techniques, the text presents an economic theory for market formation that

provides students and professionals with a better appreciation of basic modeling.

The strength of the text is its synthesis. Thore's convincing thesis is the usefulness of linking basic model types. The resulting concatenation is "economic logistics," the analysis of resource production, inventory, and distribution systems. Most importantly, he joins the transportation problem, activities analysis, and the warehouse problem. The transportation problem traces the spatial movement of goods from production to retail outlets. Activities analysis considers the constituent stages or "activities" of production wherein raw materials are converted first to intermediate and then to final goods. The warehouse problem uses inventories to smooth the time paths of inputs and outputs. Combining the first two model types allows analysis of spatial flows of commodities through a production chain. Linking the transportation and warehouse problems leads into the analysis of regional warehouse systems. Joining activities analysis and the warehouse problem enables a look at multistage warehouse systems of intermediate goods coming into the production and distribution of final goods. The result of this synthesis is a compelling portrait of

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the economic sector as a chain of optimizing behavior that solves for optimal market prices and quantities. Numerous examples and exercises emphasize the usefulness of this set of tools in transforming empirical observations into economic insights of practical concern.

One weakness of the text is that Thore's initial models, the building blocks for his synthesis, are intentionally basic. Compared with other mathematical programming texts (for example, Hazell and Norton, 1986¹), the material here is older. Thore's choice of material does facilitate his synthesis, but limits much of the discussion to fairly simple models. This shortcoming is minor, though, because students would do well to think creatively with these time-honored methods before moving on to more advanced ones. Thore does provide references to newer material and, with his bibliographic notes, excellent historical documentation. He also acknowledges limitations of the material. For example, the Takayama-Judge extension of Samuelson's spatial equilibrium analysis to multiple commodities is dismissed as artificial because of its assumption of symmetric demand and supply-price coefficients. A more serious drawback of the book is its failure to discuss solution algorithms. That omission is inconsistent given Thore's advocacy of basic models, suggesting that researchers benefit from intimate familiarity with their models but not from familiarity with the ways these models are solved. He does credit advances in software and hardware that have made nonlinear programming a practical tool for the classroom (p 11), but then abandons the subject.

Thore's intended audience goes beyond the graduate classroom to economists who have not realized the full strength of the tools of mathematical programming developed over the last fifty years. Techniques such as chance-constrained programming and goal programming (developed by Thore's sometimes collaborators, A. Charnes and W. W. Cooper) can provide economics with the operational significance it needs, Thore argues. His book both explains and advocates mathematical programming. The joining of purposes is fitting since he wants to give all a greater appreciation for the power of mathematical programming. Students must learn what professionals should relearn.

Economic Logistics applies mathematical programming to a wide range of economic problems, from the regulation of whaling to the manufacture of

personal computers. For agricultural economics instructors, the general presentation can be both a strength and a weakness. Both the breadth and technical clarity of the book are clear advantages. Saddle point theory and game theory, for example, receive explanations for the novice. As a general economics text, however, the reader finds fewer specific applications to farm modeling, as compared with alternatives, such as Hazell and Norton's text. In particular, Thore relies on a single technique (chance-constrained programming) to model risk, which is more acceptable for students in economics than in agricultural economics, where risk receives greater emphasis. Instructors using Thore's text for agricultural economics gain the generality of his scope but may need supplementary readings to cover the range of risk-modeling techniques and specific farm models.

There is at bottom an eclectic. His basic curiosity of how modern economies function motivates diverse discussions of mathematical programming and economic theory toward the end of the book. These discussions add flesh to his synthesis and display the operational capability of the material. For example, Thore sees surpluses of agricultural commodities and unemployed labor as disequilibria and models them with price constraints. His labor market example is decidedly unconventional since its objective function maximizes the *ex ante* value of unemployed labor. In another discussion, he invokes chance-constrained programming to model technological change, which occurs today, he argues, via small, predictable jumps in productivity, rather than the large leaps that Schumpeter described in his day (and that would invalidate such a modeling approach). The last chapter describes bidding behavior as an infinite game to incorporate uncertainty about competitors and market reactions. With these discussions, Thore offers what countless economists have offered before him: a vision of how markets form.

Good modelers are technically competent and imaginative. *Economic Logistics* is both, which is why I recommend it despite minor criticisms. Thore offers mathematical programming as inventive, unconventional microeconomic theory. He uses language much like Wassily Leontief and Frederick Waugh in describing what he thinks economists should do. His economics is an aggregation of models of individual producers, shippers, and warehouses, forming a logistical system that solves for optimal market prices and quantities. He argues that economists are not enough concerned with the operational significance of relevant economic questions. His insights motivate the

¹Peter B. R. Hazell and Roger D. Norton. *Mathematical Programming for Economic Analysis in Agriculture*, New York: Macmillan, 1986.

reader, for technique alone is hardly economics, let alone good reading. For the graduate classroom, *Economic Logistics* provides a synthesis of basic mathematical programming with an imaginative

demonstration of its capabilities. For the rest of us, it is a reminder of tools developed over the past half-century and their power when in creative hands.

Unheeded Prophecies or Misguided Meanderings?

Environmental Policy and the Economy. Edited by F.J. Dietz, F. van der Ploeg, and J. van der Straaten. Amsterdam: North-Holland, 1991, 331 pages, \$69.50.

Reviewed by John K. Horowitz

This collection of articles made me fear for the earth's survival. But, should I? According to the authors, environmental problems and the inability of economies to deal with them seem to be leading to a great catastrophe. Yet, it's striking how little of the economy is actually affected by environmental problems. There are exceptions, of course, such as the pollution of the Aral Sea in Kazakhstan or the drought in southern Africa (if this can be attributed to global warming). Environmental degradation in the economy is mirrored primarily through citizens' concerns about ecosystem damage, not through declines in productivity. Many of the ecological-economic papers in this book just may be misguided.

This book collects 13 papers presented at "Economics of the Environment," a conference organized by the Center for Economic Research at Tilburg University, the Netherlands, in September 1990. It contains theory papers (optimal control, input-output analysis), simulations, experiments, contingent valuation and benefit-cost analysis, and qualitative discussion pieces. The editors, to their credit, have done a good job organizing such diverse papers.

The section on "Environmental-Economic Modeling" contains papers on exhaustible resources, stock and flow pollutants, and population growth in the context of sustainability. Most notable is the paper by Henk Peer on sustainability, which has the grand title, "An Inquiry into the Nature and Causes of the Wealth of Planet Earth." This paper investigates sustainability using a neoclassical growth model and includes two elements that are important in analyzing sustainability, namely positive population growth and the use of finite, nonrenewable resources. Sustainability means "a constant savings/investment ratio, a constant aver-

age productivity of capital, and a constant stock of the exhaustible resource (measured in years)" (p. 66). The author concludes that under reasonable conditions there exists a sustainable steady state for the world economy. This encouraging scenario (per capita consumption rising at 2 percent per year) is undercut by a lack of model details or any mention of initial conditions.

The "Valuation of the Environment" section is even more wide-ranging, including an experimental analysis of learning about the value of a public good, a contingent valuation study of the transformation of peat bogs on Scotland to commercial forest, and a discussion of the political economy of environmental issues. This latter paper, "Ecological Perception and Distribution Conflicts" by Joan Martinez-Alier, is a criticism of modern economies' approaches to environmental problems. It finds fault with both neoclassical and ecological economics as economic paradigms. This chapter is a combination of poor or incorrect economic explanations and some genuinely good ideas, accompanied by some peculiar vocabulary like *elucubrations*, *chrematistic*, and *narodnism*.

The third section, "Environmental Policy," consists of three papers on the political economy of environmental policy instruments, legal aspects of marketable pollution permits, and the role of the firm in an "ecological economy." Marjan Peeters' chapter takes up legal issues pertaining to a tradeable-permits market that economists might otherwise overlook. For example, the "transfer of a pollution right will have as a consequence that the pollution will occur at another place or time than before" (p. 156), exposing private citizens who are near an industrial plant that purchases pollution rights to more pollution. Citizens' legal standing as "third persons," with certain rights pertaining to the pollutants they are exposed to, may depress the permit market if it results in few trades being allowed to take place.

The final section, "Economic Consequences of Environmental Policy," contains papers on carbon taxes in the United Kingdom, fertilizer use in the Netherlands, and chemical use in U.S. and EC agriculture. More focused than many others in the

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