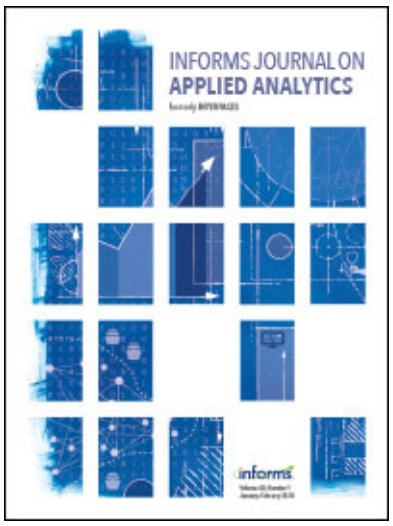

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Book Reviews

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Book Reviews

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Abstract. In *Book Reviews*, we review an extensive and diverse range of books. They cover theory and applications in operations research, statistics, management science, econometrics, mathematics, computers, and information systems. In addition, we include books in other fields that emphasize technical applications. The editor will be pleased to receive an email from those willing to review a book, with an indication of specific areas of interest. If you are aware of a specific book that you would like to review, or that you think should be reviewed, please contact the editor. The following books are reviewed in this issue of *Interfaces*, 48(4), July–August: *Global Production: Firms, Contracts, and Trade Structure*, Pol Antràs; *Non-Convex Multi-Objective Optimization*, Panos M. Pardalos, Antanas Žilinskas, and Julius Žilinskas.

ANTRÀS, POL. 2015. *Global Production: Firms, Contracts, and Trade Structure*. Princeton University Press. 328 pp. $49.50.

Until recently, researchers in international trade were interested primarily in explaining the many facets of trade in final goods between nations. However, a revolution in information and communication technologies, the dismantling of trade barriers by national governments, and increased participation by many in the process we now call globalization has dramatically affected the lives of most people and has altered the nature of international trade. Most international trade today is not based on the exchange of final goods across national borders. Instead, most international transactions are dominated by the sales of specific components and intermediary services between firms. In such an environment, it is important to analyze contracting issues. As such, the basic objective of this book is to "study the various ways in which the contracting environment shapes the location and internalization decisions of firms in the global economy" (p. 27).

The book is based on the Centre de Recerca en Economia Internacional (CREI) lectures in macroeconomics delivered by the author in Barcelona in 2012. He begins the proceedings by pointing out that much of the most interesting research in contemporary international trade builds on a prominent paper by Melitz (2003). Therefore, to appreciate this contemporary research, it is essential to first have a good understanding of the basic Melitz model. To this end, we learn that the Melitz model essentially says that three events will happen when there is a reduction in the costs of trade. First, the number and the revenues of exporting firms will increase. Second, the scale of firms that do not export will decrease. Finally, we will see "the exit of a set of producers that were marginally profitable before the reduction in trade costs" (p. 39).

With this primer on the Melitz model completed, Antràs proceeds to the first of the two major sections that comprise this book. The goal in this section, which he titles "Location" is to analyze the effects of introducing contractual imperfections into some standard international trade models. The analysis undertaken here tells us that, consistent with our intuition, contractual insecurity attenuates the aggregate gains from international trade. We also learn that such insecurities shape how these gains are distributed among nations. Therefore, there exist circumstances in which nations have "a *unilateral* incentive to create some amount of contractual insecurity for producers attempting to sell in their markets" (p. 68, emphasis in original).

What impacts do alternate contractual payment mechanisms have on trade? Antràs studies this question ably and points out that when contracts are associated with what he calls "post-shipment payments," the quality of institutions in importing nations affects both the profitability and the structure of exports. In contrast, when transactions are completed on a "cash-in-advance" basis, the quality of institutions in exporting nations influences the profitability and the structure of exports. A general lesson emanating from the author's analysis here is that "weak contract enforcement has the

potential to affect the global organization of production in…profound ways…" (p. 93).

Next, Antràs concentrates on the implications of weak contract enforcement for the international organization of production. His global sourcing model yields an interesting theoretical result. Specifically, we learn that weak contract enforcement across nations will tend to diminish the profitability of global sourcing strategies and hence favor "a larger reliance on domestic intermediate inputs" (p. 107). Antràs does not stop with his theoretical analysis, but also focuses on the development of empirical tests of his global sourcing model. The tests he designs provide support for the global sourcing model; however, as he readily acknowledges, there potentially exist "serious econometric biases" (p. 165) that need to be addressed adequately. This caveat notwithstanding, it is difficult to disagree with the point that at least for U.S. firms, variations in contract enforcement across nations are a salient determinant of the observed variation in their propensity to make offshoring decisions.

The second major section of this book is titled "Internalization," which refers to "the extent of control that firms choose to exert over the production of the different parts and components in their value chain" (p. 169). The topic of internalization is interesting precisely because it frequently occurs across national borders; when this happens, the significant point to grasp is that the investing entity is a multinational firm and "any flow of physical goods between related parties constitutes intrafirm international trade" (p. 169). According to Antràs, the internalization decision is best analyzed with one of two possible approaches. The "transaction-cost approach" is inspired by the prior work of Ronald Coase and Oliver Williamson (Habimana 2016). This approach emphasizes the primacy of transaction costs. In contrast, the "property-rights approach" stresses the allocation of ownership rights over physical assets.

After an elaborate discussion of both approaches, which demonstrates nicely how these approaches can be embedded into his global sourcing model, Antràs comments at length on the ways in which the available data can be marshalled to shed light on the usefulness of these two approaches. His detailed empirical analysis shows that the existing data provide more support for the property-rights approach than for the transaction-cost approach. Even so, this conclusion must be viewed as preliminary because, as Antràs rightly cautions, "the tests performed…have relatively low statistical power" (p. 260). Given this tentative finding, Antràs concludes the book by suggesting three methods that one might use to come up with better ways of discriminating between the transaction-cost and the property-rights approaches in determining boundaries of multinational firms.

In summary, the author is a prominent scholar in international trade; hence, it is no surprise that this book provides a serious and competent analysis of topics such as offshoring, global value chains, and the activities of multinational firms. Readers who spend time carefully perusing this book will certainly find themselves transported to the frontier of present-day research in international trade.

References

Habimana O (2016) from Coase to Williamson: Evolution, formalization and empirics of transaction cost economics. *J. Social Econom. Res. Acad. Social Sci.* 3(1):36–42.

Melitz MJ (2003) The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*. 71(6): 1695–1725.

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PARDALOS, PANOS M, ANTANAS ŽILINSKAS, JULIUS ŽILINSKAS. 2017. *Non-Convex Multi-Objective Optimization*. Springer, 192 pp. $109.99.

The monograph is dedicated to nonconvex multiobjective optimization and is the first monograph devoted entirely to this topic. Nonconvexity raises two serious difficulties in multiobjective optimization. First, not all scalarization methods can find an arbitrary element of a nonconvex Pareto front. Second, nonconvex objectives require global optimization, even in the single-objective case; therefore, finding a single Pareto optimal solution of a scalarized problem is computationally difficult. The best approach for nonconvex multiobjective optimization is to simultaneously tackle these difficulties using global multiobjective optimization. This is one of the key strategic points made by the authors.

The book begins with the introductory section on basic concepts in Part I. This part can be used as consistent material for an advanced course for students without prior knowledge in multiobjective or nonconvex optimization. It includes several examples, which illustrate both types of difficulties in multiobjective problems. It also gives an example of a combinatorial multiobjective optimization problem, which also includes nonconvexity in the feasible decision region. The chapter on scalarization presents general ideas and reviews methods suitable for the computation of any Pareto optimal solution of nonconvex

multiobjective problems. Approximate representation of Pareto sets is also discussed. The introductory section ends with a review of global single-objective optimization paying particular attention to the approaches that are generalized to multiobjective optimization in this book: Lipschitz optimization, including branch and bound, methods based on the use of statistical models, and branch- and probability-bound methods.

Part II, the main part of the book, has a similar structure; its chapters relate to specific types of methods. It starts with a chapter on multiobjective branch and bound. The main concept of branch-and-bound algorithms is to use bounds for the objective functions to detect subsets of feasible decisions not containing optimal ones. This concept also holds in a multiobjective case by detecting and discarding subsets that cannot contain Pareto optimal decisions. Instead of running a global optimization algorithm several times for scalarized problems to find representatives in the Pareto front, one run of a multiobjective branch-and-bound algorithm results in a representation of the Pareto optimal set with predefined accuracy using subsets of feasible decisions. General branch-and-bound algorithmic schemes are presented well in the book and illustrated by the development of an example of a biobjective branch-and-bound algorithm for a practical cell-formation problem showing its superiority over evolutionary algorithms. This chapter is written well and may inspire an enthusiastic reader to make efforts and develop his (her) own versions of branch-and-bound algorithms for multiple-extremal multiobjective optimization.

The chapter on worst-case optimal algorithms aims at finding a worst-case optimal approximation of the Pareto optimal set. The class of Lipschitz functions is chosen and the lower Lipschitz bounds for objective functions are used to build a bounding front for the Pareto set. A one-step optimal algorithm for one-dimensional biobjective optimization problems is developed and generalized to the multidimensional case using branch and bound with a trisection of hyperrectangles. Numerical examples are provided and show an interesting application of a diagonal approach to multiobjective optimization with an illustrative representation of the partition by diagonals of explored rectangles forming a nonuniform net filling the feasible space.

Statistical model-based algorithms are another generalization of single-objective global optimization to multiobjective cases. The constructed algorithms are aimed at optimization problems with expensive black-box functions. Multiobjective versions of several known single-objective algorithms are developed and investigated experimentally on test problems for nonconvex multiobjective optimization. The part on algorithms finishes with the chapter dedicated to randomized algorithms for nonconvex multiobjective optimization. Statistical methods of extremal values are used to develop a multiobjective branch-and-probability bound method extending well-known concepts in single-objective global optimization. Probabilistic upper and lower estimates for the Pareto front are used. The approach seems to be fresh and holds much promise.

The final part of the book, Part III, is devoted to several applied areas where problems of nonconvex multiobjective optimization occur. Because many areas exist in which multiobjective optimization problems arise, attempting to mention all conceivable applications in such a book is impossible. The book uses two classes of multiobjective optimization problems to illustrate the solution and analysis of such problems. One chapter in Part III is dedicated to the visualization of the Pareto optimal decisions in multidimensional cases to aid analysis of multiobjective optimization in the optimal design of a chemical engineering process. Another chapter on applications is dedicated to the multiobjective visualization of business-process diagrams. Aesthetic layouts of diagrams are informative and easily readable. To automate the aesthetic drawing of such layouts, the book defines several multiobjective optimization problems. One class of problems is dedicated to the drawing of sequence flows where multiple objectives include the lengths of connectors and the numbers of bends. Another class of problems is dedicated to the allocation of shapes in business-process diagrams where multiple objectives include the total length of connectors and right down flow violations. The chapter presents solutions of these multiobjective problems by reformulating them as binary linear models, using heuristic methods, and developed branch-and-bound algorithms illustrating approaches described earlier in the book.

The book is well written and can be recommended to researchers and postgraduate students in computer science, mathematics, engineering, and management science, as well as practitioners in various fields who aim to solve multiobjective optimization problems where convexity of the Pareto front and (or) objectives cannot be assumed.

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