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*The Microeconomics of Complex
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This textbook is an ambitious attempt to propose a comprehensive microeconomic view as an alternative to the dominant neoclassical counterpart. As the authors note (p. xix), Samuel Bowles' *Microeconomics* (Princeton University Press, 2004) may be the only literature that resembles this book. It may well be stated that the authors present even broader horizons and interests than Bowles'. I must confess that not a few of them are beyond my knowledge, and so my review does not suffice in appreciating the real worth of this book.

The preface (pp. ix-xix) specifies that the 2007-8 crisis and its aftermath afford a powerful motivation behind this book. In the first paragraph, the authors state: "Admittedly, economics has not been really successful so far in contributing to the solution of the most basic problems of mankind. Contributing to the solution of the problems of the world nowadays would mean to give useful advice

for a more sustainable, and socially and regionally inclusive, more stable, and reliable economic development, where all agents may become capable of learning, investing in their human and social capital, and innovating in a broad sense” (p. ix). The authors then criticize the neoliberal recipes and mainstream economics for their inadequacy—more specifically, oversimplification—in dealing with the 2007–8 crisis. Moreover, the authors argued that “This crisis . . . appears to be . . . a case of collective negative unintended consequences of what appeared rational individualism” (p. x). Thus, the authors maintain: “In a real-world economics, we will have to drop the idea of a simplistic, noncomplex structure or process, and a predetermined, optimal, and stable equilibrium. A whole and rich world of rigid economic analysis has been opened up through this” (p. xi). Subsequently, the authors touch on the strengths and weaknesses of neoclassical mainstream economics.

In the latter part of the preface, the authors characterize complexity (micro-) economics advocated by them:

Complexity (micro-)economics results from a number of sources, from the analysis of dynamic and complex systems, the resurgence of biological analogies, modern statistical non-equilibrium physics, population thinking, and evolutionary economics, networks analysis, applications of (evolutionary) game theory, experimental behavioral economics, the new analytical opportunities of complex modeling and related computer simulations, and from evolutionary-institutional economics. (p. xiii)

Complexity (micro-)economics implies that a real-world market economy will have to be conceptualized as a complex phenomenon, embedded in a set

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of mechanisms and entities that basically are its counter-principles, such as bureaucracies (hierarchy), networks, jointly learned (informal) social rules and institutions, and the state. Only all of these together give life, sense, meaning, and workability to a spontaneous, decentralized mechanism that we are used to calling a “market,” while both limiting and enabling the market to work at all, when otherwise it might not even come into being. (pp. xiii-xiv)

Thus, the authors imply that complexity economics requires highly broad and interdisciplinary knowledge and underscores that its basis lies in the realities of direct interdependence among agents. This contrasts starkly with neoclassical mainstream economics limiting its scope to inter-human relationships *via* the market.

The authors then clarify the purport of this book: “This textbook redrafts basic microeconomic modeling and teaching from scratch, on the basis of the wealth and breadth of complexity economics that have evolved in the last three decades” (p. xvi).

Part I (“Basics of the Interdependent Economy and Its Processes”) consists of four chapters (Chapter 1-4).

Chapter 1 (“Introduction to the Microeconomics of Complex Economies,” pp. 3-23) presents overviews on key issues in this book such as agent interdependence, competing paradigms in economics, uncertainty, bounded rationality, path dependence, social rules, and institutions. These descriptions afford useful preliminary knowledge of this voluminous work to the readers. In this chapter, the authors reaffirm: “directly interdependent, and thus *interactive*, situations and their consequences in truly *multipersonal* (or ‘social’) decision situations (and

thus 'social' economy) are at the center of this textbook" (p. 5; emphasis in the original).

Chapter 2 ("Tools I: An Introduction to Game Theory," pp. 25-32) offers introductory remarks on how game theory is useful in elucidating central subjects of this book, especially addressing two general concepts of economic modeling: the invisible hand and the fallacy of aggregation. The authors mention: "[the former] model justifies ignoring the micro-level of direct interactions (since everyone chooses equivalently and optimally). A different story is told by the *fallacy of aggregation*" (p. 27; emphasis in the original). Simple cases of the social optimum game and prisoners' dilemma game, which represent the invisible hand and the fallacy of aggregation models, respectively, are illustrated. The authors emphasize:

Until very recently, a large part of the profession of economics chose to forego using game theory This was because direct interactions are very difficult to fit into general equilibrium models which in turn made it possible for the first time to analyze the economy as a whole and the nontrivial interdependence between different sectors, still one of the most important accomplishments in the history of economics. However, this came at the cost of scarifying heterogeneity and direct interaction and reducing the social sphere to an agglomeration of homogeneous agents. The elaborate models of perfect markets in effect shifted the attention away from strategic interactions to another part of economic reality. (p. 31)

Also using game theory, Chapter 3 ("Problem Structures and Processes in Complex Economies," pp. 33-55) discusses social problems in terms of

coordination. This chapter further explains solutions to social dilemma problems arising from dysfunction of the invisible hand.

At the beginning of Chapter 4 (“Approaching Real-World Interdependence and Complexity: Empirical Phenomena in the Global Economy,” pp. 52–93), the authors state: “Today’s economies are inherently *complex*, in terms of *numbers of agents* involved in economic processes and *agents’ heterogeneity* . . . It becomes immediately clear that *direct interdependencies* and *direct interactions* among economic agents, with related *strategic uncertainty* and requirements of rule-based *coordination* or institutionalized *cooperation* do matter” (p. 59; emphasis in the original). From this point of view, Chapter 4 introduces some basic present-day issues such as neoliberal market deregulations, network problems, and individualistic vs. common and collective strategies. The following passage delivers one of the authors’ central messages in this chapter: “the global economy would not provide enough institutional structure to reduce complexity sufficiently to make agents (companies, governments, and social agents of all kinds) capable to behave in coordinated, cooperative, and thus problem-solving ways, but it would even add to *increasing complexity* and *turbulence* for individual decision makers, and to *systematic volatility*” (p. 65; emphasis in the original).

Part II (“Markets: General-Equilibrium Theory and Real-World Market Structures”) consists of three chapters (Chapter 5–7).

Chapter 5 (“The Ideal Neoclassical Market and General Equilibrium,” pp. 97–128) explains basic concepts of neoclassical economics: paradigm, consumer theory, production theory, partial equilibrium, general equilibrium, and treatment of imperfect information.

Chapter 6 (“Critiques of the Neoclassical ‘Perfect Market’ Economy and Alternative Price Theories”, pp. 129–155) first points out defects of neoclassical

economics on the analogy of mechanics, referring to Philip Mirowski's views in his book *More Heat than Light* (Cambridge University Press, 1989). The authors also touch on the epistemic break between classical and neoclassical economics. They then elucidate internal inconsistencies in neoclassical economics—especially regarding its demand and supply concepts—and criticize its theory of preferences and choice by emphasizing the endogeneity of preferences and conspicuous behavior. The authors further present Sraffian, Post-Keynesian, and institutionalist theories as alternatives to neoclassical price theory.

Chapter 7 (“Real-World Markets: Hierarchy, Size, Power, and Oligopoly, Direct Interdependence and Instability,” pp. 157–190) treats monopoly, oligopoly, and monopolistic competition assumed by many real markets, which are characterized by a persistent variety of firms with different size, organization, internal culture, and behavior, and, with introductory explanations, affords insights into power relationships in them. The authors underscore: “Overall, real-world oligopolistic markets—beyond just either oligopolistic equilibrium with homogeneous goods or monopolistic competition with relative price stability—appear to remain a *complex, unstable, and sometimes turbulent form*” (p. 184; emphasis in the original).

Part III (“Further Tools and the Analysis of Complex Economics”) consists of four chapters (Chapter 8–11).

Chapter 8 (“Tools II: More Formal Concepts of Game Theory and Evolutionary Game Theory,” pp. 193–226) provides more detailed explanations about game theory. Touching on its formal concepts, and then going into “normal” (Nash Equilibrium) and other forms, the authors elucidate that game theory possesses broad potential not only for the understanding of the neoclassical general equilibrium theory but also for that of evolutionary and complex

economy models.

Chapter 9 (“Tools III: An Introduction to Simulation and Agent-Based Modeling,” pp. 227–249) makes introductory comments on simulation. While pointing out the weaknesses of simulation, the authors argue that its agent-based methods can enable us to construct models with a much more generic microfoundation than is the case for general equilibrium models.

Chapter 10 (“A Universe of Economics: Independence and Complexity, System Trajectories, Chaos, and Self-Organization,” pp. 251–276) discusses complexity economics and neoclassical mainstream economics by comparison. The authors underline once again that the former attaches importance to direct interdependence and subsequent direct interactions among agents, whereas the latter excludes them through the assumption of perfectly informed agents who are reduced to being the representative individual. The authors maintain: “with direct interaction the ‘optimal rationality’ as postulated by neoclassical ‘market’ economics is impossible to maintain—unless one sets such restrictions as to make a complex system very simple. This is not at all the end of economics but the beginning of a more relevant, substantial, realistic, and also formally analyzable economics” (p. 255). The scope of this chapter extends into dynamic and chaotic systems. The authors conclude that “general-equilibrium models represent only an extreme point in the field of possible ways to model economies using dynamic systems, most of which would yield models with very different characteristics and results” (p. 275).

Chapter 11 (“Dynamics, Complexity, Evolution, and Emergence—The Roles of Game Theory and Simulation Methods,” pp. 277–304) develops theoretical arguments integrating basic ideas shown in the preceding three chapters. In Chapter 11, clarifying the complexity-related concepts, the authors contrast the

essentials of real economies with the economy visualized by neoclassical economics.

Part IV (“History of Thought and Contemporary Models in Complexity Economics”) consists of three chapters (Chapter 12–14).

Chapter 12 (“Themes of Complexity in the History of Economic Thought: Glimpses at A. Smith, T. B. Veblen, J. A. Schumpeter, and Others,” pp. 307–362) treats the thinking of great economists in history from Adam Smith to Luigi Lodovico Pasinetti. What is remarkable about this chapter is that the authors are not shackled by conventional notions of history of economic thought and make reappraisals of respective economists’ ideas from the perspective of this book focusing on economic complexity.

Chapter 13 (“Recent Core Models of Complexity Microeconomics,” pp. 363–418) refers to main models in the title field such as those by Amartya Sen, Andrew Schotter, Robert Axelrod, Kristian Lindgren, Thomas C. Schelling and R. Axelrod, T. C. Schelling and W. Brian Arthur. Thus, this chapter offers us informative knowledge about the frontiers of complexity microeconomics.

Chapter 14 (“The Size Dimension of Complex Economies—Towards a Meso-Economics: The Size of Interaction Arenas and the Emergence of Meso-Platforms of Institutional Coordination,” pp. 419–447) expounds agents’ preference for “meso”-sized structures by using methods introduced in preceding chapters. The authors emphasize the significance of the topics of this chapter by stating that “The most basic social fact of economics will be rationally reconstructed in an approach to a broader future meso-economics” (p. 421). They conclude: “The approach to meso-economics explained here still is a young field of complexity economics and still far from being fully understood and sufficiently elaborated.... further strengthening relevant, applied, empirical, and policy-

oriented economic research, such as the topical research on general trust and macro-performance, not least requires further elaboration and simulation of the logic and process of meso” (p. 443).

Part V (“Further Applications: Information, Innovation, Policy, and Methodology”) consists of four chapters (Chapter 15–18).

Chapter 15 (“The Information Economy and the Open-Source Principle,” pp. 451–471) deals with issues concerning contemporary information knowledge. This chapter delves into social dilemma and strategical impacts on industries with network externalities caused by informational development. The authors further discuss open source and information policies. Thus, this chapter indicates that today’s information problems can be resolved by economics of complexity using relevant techniques.

Chapter 16 (“Network and Innovation—The Networked Firm, Innovation Systems, and Varieties of Capitalism,” pp. 473–498) investigates innovation and its surroundings. Arguing that “the treatment of innovation processes that we find in neoclassical formulations leave some aspects outside the scope of the respective treatments that have been found to be integrative aspects of the whole process” (p. 476), the authors apply their complexity-based point of view to such problems as the relationship between firms and national innovation systems, thereby highlighting the endogeneity of development and varieties of capitalism, which have been neglected by neoclassical economists.

Chapter 17 (“Policy Implications: New Policy Perspectives for Private Agents, Networks, Network Consultants, and Public Policy Agents,” pp. 499–527) explores policy implications of complexity economics. The authors write that “the alleged neoclassical ‘benchmark’ of a perfect market economy simply dissolves and there is *no longer an obvious, predetermined benchmark for policy*

orientations” (p. 501; emphasis in the original). This chapter first gives hints for policy for complex economy and then details interactive and institutional policy and implication for information and innovation policy. Criticizing neoliberal policy, the authors conclude: “A public policy agent pursuing a conception of interactive/institutional economic policy may basically be able to initiate, accelerate, and stabilize the formation of a *strong culture of cooperation* so that, in an evolutionary process, an extremely individualistic culture may fade away behind the ‘veil of history’” (p. 525; emphasis in the original).

Chapter 18 (“How to Deal with Knowledge of Complexity Microeconomics: Theories, Empirics, Applications, and Actions,” pp. 529–551) discusses methodology. This chapter refers to such influential approaches as neoclassical model Platonism, Milton Friedman’s instrumentalism, critical rationalism, and critical realism. Subsequently, maintaining that “It should have become obvious throughout this textbook, and through this chapter in particular, that it is hard, if not impossible, to imagine an effective scientific discipline with only one ‘monist’ scientific paradigm” (p. 545), the authors emphasize the necessity of pluralism.

I should repeat that I do not have adequate learning to fully appreciate this book. First of all, the authors impress the readers with their remarkably broad and profound knowledge and interests. They have not only acquired highly mathematical and informational techniques but also keen insight into social and historical issues. This reminds me of John Maynard Keynes’ famous words: “the master-economist must possess a rare *combination* of gifts. He must reach a high standard in several different directions and must combine talents not often found together” (Essays in Biography, in *The Collected Writings of John Maynard*

Keynes, Vol. X, Macmillan, 1972, p. 173; emphasis in the original). Indeed, only such personality could convincingly provide complexity perspective of economic reasoning.

Among others, the authors' competence is displayed in their use of game theory and simulation. They have been frequently utilized by mainstream economists. However, the authors lucidly show that these methods can be more effectively applied to main problems in complex economies. Thus, the descriptions in Chapter 11 fully convey the authors' real intention underlying the whole book.

Chapter 12 demonstrates more of the authors' unusual penetration. I am a researcher on the history of economic thought. Needless to say, therefore, this chapter contains many topics on which I can make specialist comments. Unlike most mainstream economists, the authors attach importance to past economists' views. However, it is not owing to nostalgia but based on the authors' own economic ideas. Consequently, they afford unique and fresh outlooks on great economists in history. This feature is especially distinguishing in their treatment of A. Smith, Carl Menger, Alfred Marshall, and Keynes.

For instance, the authors state: "Smith assumed a basic social situation involving *direct interdependence* and *strong uncertainty* as the basis of his social theory. Within a social setting of this kind, the problem of the *spontaneous emergence* of institutions was the main question Smith addressed in the TMU [*The Theory of Moral Sentiments*]. And he developed a theory of the emergence of *basic institutions* that is surprisingly modern in character and of relevance to modern evolutionary-institutional analysis" (p. 313; emphasis in the original).

The authors also write on Keynes: "in *price formation*, *income determination*, and *interest rate* (price of money) *formation*, we find complexity theorizing in

Keynes in the sense of a dominant role of uncertainty, expectations, institutionalized behavior (sometimes more 'instrumental,' but often more 'ceremonial,' depending on the whole micro-macro-constellation), and even dynamics of social struggle" (p. 335; emphasis in the original).

Hopefully, the authors publish a monograph on the history of economic thought along the same line of thinking. This would contribute to activation in this field.

Although students may have trouble understanding the contents of this book, the authors draw up helpful syllabi for readers at different levels. This makes the book fairly accessible. However, I strongly recommend reading the whole book thoroughly. This will enable the readers to appreciate the real intention and value of this writing, and it is highly rewarding indeed.