Conclusions and future directions in microeconomics: Bounded rationality and efficiency within complexity

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Microeconomics can offer valuable insights for a better understanding of the complex challenges facing the modern world. At the same time, the inherent complexity of these problems requires a holistic approach that draws not only on the foundations laid by classical economists but also incorporates advances from behavioural economics and decision theory. By integrating these perspectives, advanced microeconomics is better equipped to capture the nuanced and often nonlinear nature of real-world economic behaviour and decision-making processes.

Traditional models based on entirely rational agents operating in perfectly competitive markets are proving insufficient to capture the real-world behaviour of individuals and organisations. Having initially focused on identifying optimal choices under clearly defined alternatives and consequences, decision theory is expanding to account for ambiguity, incomplete information, and adaptive behaviour. This is particularly relevant in environments where decisions must be made iteratively, based on evolving information and feedback. The concept of bounded rationality plays a crucial role here, recognising that agents operate under cognitive, informational, and time constraints. Rather than optimising, individuals often satisfy or rely on heuristics, though not always optimal.

At the same time, the economics of complexity provides a complementary perspective. It shifts the focus from equilibrium outcomes to the dynamic processes through which patterns emerge from decentralised interactions. Complex systems theory emphasises feedback loops, nonlinear relationships, path dependency, and emergent behaviour—features common in real-world markets,

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networks, and organisations. Agent-based modelling, network analysis, and evolutionary approaches are becoming essential tools for studying such phenomena. These frameworks enable economists to examine how micro-level behaviour contributes to macro-level outcomes, often in unexpected ways. The essays in this volume reflect this paradigm shift by integrating behavioural insights, strategic interaction, institutional dynamics, and non-standard preferences, thereby offering a richer and more realistic understanding of rationality, efficiency, and decision-making.

This closing chapter aims to synthesise the contributions gathered in this volume and to articulate future directions for research in advanced microeconomics. While diverse in scope and methodology, the chapters converge around a shared recognition that the complexity of contemporary economic behaviour cannot be fully understood through models grounded exclusively in classical assumptions of perfect rationality and perfectly competitive markets. The chapter challenges conventional analytical boundaries by highlighting the relevance of behavioural insights, decision theory, cognitive limitations, institutional structures, and technological transformation. Building on these insights, this chapter argues that the future of microeconomic research lies in embracing three mutually reinforcing perspectives: complexity, bounded rationality, and institutional realism. These frameworks allow economists to engage more directly with the heterogeneity and uncertainty that characterise real-world economic environments. In what follows, the contributions of individual chapters to this shift are reflected upon, and a broader research agenda is presented that moves beyond equilibrium-centred models toward a more integrative, empirically grounded, and policy-relevant microeconomics.

Economic theory and decision-making theory

Economic theory and decision-making theory are closely related yet distinct disciplines that together deepen our understanding of human behaviour. Economic theory primarily serves as a descriptive science that focuses on explaining how economies operate, analysing agent behaviours, resource allocation, and the interactions between supply and demand. Economic theory, as elaborated by Varian (1992), primarily focuses on describing how markets operate and how agents allocate resources under assumptions of rationality and equilibrium.

In contrast, decision-making theory is a more formal, mathematical, and logical discipline concerned with the process by which individuals or organisations select the best course of action from a set of alternatives under given

constraints and criteria. Economic theory is a descriptive science that aims to explain economic reality. In contrast, decision theory is a mathematical and logical discipline.

According to Kornai (1973), decision theory seeks to determine the most appropriate course of action based on a given decision criterion. The solution to a problem should be logically valid and subject to verification using mathematical and logical methods. In decision theory, solving a problem means identifying the action that is most appropriate in a given situation, taking into consideration a set of possible alternatives with known consequences, and a specified criterion of choice. This means that decision theory focuses on identifying the rational decision when all the above-mentioned elements—alternatives, consequences, and choice criteria—are given (Kornai, 1973).

Decision theory is not limited to economics; it is a multidisciplinary field studied by philosophers, sociologists, psychologists, and other scholars. Decision theory is a more general framework that provides recognition of how and why decisions are made. In contrast to economic theory, decision theory may incorporate scenarios where individuals do not act in their own best interests or make choices that seem illogical.

The problems of decision-making have been a subject of economic research since the time of Adam Smith, primarily focusing on both sides of the market—supply and demand—specifically on how much will be produced and at what price it will be sold (Miller & Starr, 1969). Economists have traditionally addressed these questions using the concept of utility, which is understood as a representation or summary of the information conveyed by the preference relation (Jehle & Reny, 2011).

In economics, rational choice theory rests on several key principles and assumptions that aim to explain how individuals select from among alternatives. Choice theory assumes that individuals have distinct preferences over a set of alternatives, which can be modelled using a utility function. This function assigns numerical values to each option, reflecting the level of satisfaction or benefit derived from it (Debreu, 1959; Neumann & Morgenstern, 1944). Preferences are complete and consistent, which ensures rationality in choice. Decision-makers are assumed to act rationally by selecting the option that maximises their utility, given the constraints they face (level of income and prices of goods). Individuals prefer higher levels of utility and make choices under certainty. In more advanced models, individuals face uncertainty and evaluate options based on expected utility, which combines the utility of outcomes with their probabilities (Neumann & Morgenstern, 1944). These foundations provide a rigorous framework for analysing decision-making in economics and related fields, enabling predictions about consumer behaviour, market outcomes, and strategic interac-

tions. However, real-world deviations from these assumptions have motivated extensions such as behavioural economics and bounded rationality theories.

Referring to the content of the chapters in this monograph, Chapter 3 discusses rational choice in ethical consumption, focusing on the conflict between instrumental utility maximisation and value-driven reasoning, and seeking to explain the gap between intentions and actual behaviour. Chapter 5, on the other hand, analyses why housing decisions made by seniors, which may appear to contradict objective economic rationality, are in fact motivated by behavioural factors (such as loss aversion and the status quo bias), and are rational from the perspective of subjective well-being.

Integrating insights from decision-making theory allows economists to move beyond idealised assumptions of perfect rationality, accounting for bounded rationality, uncertainty, and the complexity of real-world decision contexts. Together, these theories offer complementary perspectives: economic theory outlines the environment and outcomes, while decision-making theory explains the behavioural mechanisms that drive those outcomes.

Bounded rationality and decision-making

The concept of bounded rationality challenges the classical economic assumption that decision-makers are perfectly rational agents who always optimise their choices given complete information and unlimited cognitive capacity, initially introduced by Herbert A. Simon. Bounded rationality recognises that individuals face cognitive limitations, incomplete information, and time constraints, which restrict their ability to make entirely rational decisions (Simon, 1955). Instead of optimising, decision-makers are often satisfice—seeking solutions that are "good enough" rather than ideal. This theoretical foundation marked a significant shift away from the traditional model of rational choice, opening the door to a more realistic understanding of human behaviour.

Simon (1955) proposed several ways to make traditional models of rationality more realistic while still maintaining a level of rigorous formal analysis. These include limiting the types of utility functions and the possibility of having a vector or multi-valued utility function, as well as recognising and incorporating the costs associated with gathering and processing information.

In decision-making processes, bounded rationality implies that individuals use heuristics or mental shortcuts to simplify complex problems (Gigerenzer & Todd, 1999). While these heuristics can be efficient and effective in many contexts, they also introduce systematic biases and errors in judgment, as extensively documented in behavioural economics and cognitive psychology (Kahneman, 2011;

Kahneman & Tversky, 1979). Moreover, social, emotional and institutional factors further complicate decisions, rendering the actual process more nuanced than the strictly logical models suggest. This perspective encourages the integration of interdisciplinary insights to capture better how decisions are made in practice.

The implications of bounded rationality extend across numerous fields, including economics, management, psychology, and political science. In microeconomics, acknowledging bounded rationality leads to more accurate models of consumer behaviour, market dynamics, and organisational decision-making. It also informs policy design by highlighting the limitations individuals face when processing information or responding to incentives. Future research continues to explore the interplay between cognitive limitations, institutional environments, and technological tools that might augment human decision-making capacities, aiming to develop more comprehensive and realistic frameworks for understanding economic behaviour.

The contributions focusing on ethical consumption, senior citizens' decision-making in housing markets, and entrepreneurial behaviour point to a critical re-evaluation of the rational agent model. Instead of assuming complete information and computational capacity, these studies acknowledge the limits of human cognition and the influence of heuristics, emotions, and social context. Bounded rationality opens the door for interdisciplinary collaboration, drawing on psychology, neuroscience, and cognitive science to inform economic modelling. Future work could integrate experimental methods, survey-based approaches, and behavioural simulations to capture better how decisions are made in practice. This is particularly relevant in areas such as sustainability, aging populations, and innovation, where standard assumptions often fail to produce accurate predictions of actual outcomes.

Complexity and economics systems

As stated earlier in this chapter, traditional economic theories, particularly neoclassical economics, have long relied on assumptions such as perfectly rational agents and equilibrium states. While these models have provided powerful tools for understanding certain economic phenomena, they often fall short when addressing the intricacies and dynamic nature of real-world economies. Complexity economics is emerging as a promising alternative framework, in that it views the economy not as a static system tending toward equilibrium but as a complex adaptive system characterised by interaction, evolution, and emergence.

Complexity economics conceptualises the economy as a system composed of heterogeneous agents, whose interactions lead to emergent phenomena

that cannot be easily predicted or explained by traditional equilibrium models (Arthur, 1999). Unlike the neoclassical framework, which often assumes stable equilibrium points, complexity economics focuses on how patterns evolve through the continuous adaptation of agents to changing environments. This approach draws heavily from insights in systems theory, network science, evolutionary biology, and computer science to model economic behaviour more realistically.

Simon (1962) was among the pioneers who recognised the limits of perfect rationality and advocated for models that consider bounded rationality and adaptive behaviour, thereby setting the stage for complexity economics. More recently, scholars like W. Brian Arthur have formalised these ideas, emphasising how economies function as ecosystems, where innovation, feedback loops, and path dependence are key drivers (Arthur, 1999).

According to the scholars (Arthur, 1999; Beinhocker, 2006; Colander et al., 2004; Simon, 1962), the main characteristics of complexity economics are as follows:

1. Heterogeneity of Agents: Unlike representative agent models, complexity economics acknowledges that economic agents differ widely in preferences, resources, information, and strategies. This heterogeneity is crucial for understanding market dynamics and emergent phenomena.
2. Nonlinear Interactions: Agents continuously interact with one another and the environment in nonlinear ways, meaning small changes can produce disproportionately large effects or trigger cascading events.
3. Emergence: Macro-level economic patterns (e.g., market trends and business cycles) emerge from micro-level interactions without centralised control. These emergent phenomena cannot be deduced from the behaviour of individual agents.
4. Adaptation and Learning: Agents adapt their behaviour based on experience, learning from past outcomes and adjusting strategies dynamically rather than optimising based on fixed preferences.
5. Out-of-Equilibrium Dynamics: Instead of focusing exclusively on equilibrium states, complexity economics studies how economies evolve, including periods of disequilibrium, instability, and phase transitions.
6. Path Dependence: Historical events and past decisions have a profound influence on current and future economic outcomes, creating multiple possible trajectories rather than a single, deterministic path.

Complexity economics does not necessarily discard neoclassical insights but extends and enriches them by relaxing restrictive assumptions and incor-

porating more realistic behavioural and systemic features. While neoclassical models emphasise optimisation and equilibrium, complexity economics emphasises process, adaptation, and emergent order. This enables economists to more effectively analyse phenomena such as financial crises, the diffusion of technological innovation, market failures, and institutional change, which often elude traditional analysis.

For example, agent-based computational models, a standard tool in complexity economics, simulate heterogeneous interacting agents and can capture how micro-level behaviours aggregate into macroeconomic phenomena (Epstein, 2006). This bottom-up approach contrasts with the top-down representative agent models in neoclassical economics, offering richer explanations of economic dynamics.

Furthermore, complexity economics invites interdisciplinary approaches, drawing from psychology, biology, and network theory to understand economic systems as evolving, learning, and self-organising entities rather than static, mechanistic machines (Beinhocker, 2006).

Complexity economics provides a vital framework for understanding the economy as a dynamic, adaptive system shaped by heterogeneous agents, nonlinear interactions, and emergent phenomena. It complements and extends neoclassical economics by addressing its limitations and offering new tools to analyse real-world economic complexity. Embracing complexity economics enriches our ability to understand, predict, and manage economic systems in an increasingly interconnected and uncertain world.

Although the chapters presented here contain no research conducted from the perspective of complexity economics, and there are no direct references to this approach, several chapters in this volume suggest that advanced microeconomics must grapple with the nonlinear, interdependent nature of economic systems.

The example of the analysis of the electric vehicle market is described as a study of a rapidly evolving ecosystem, shaped by technological change, policy interventions, and the strategic behaviour of firms. Such a description of the market—one that must cope with its nonlinear and interdependent nature—corresponds closely to the challenges addressed by complexity economics. Similarly, applying the Prisoner's Dilemma to model interactions in headquarters–foreign subsidiary relations, particularly regarding decision-making on sustainable development (ESG), highlights the importance of understanding interaction effects in multi-agent systems, which is one of the key areas of inquiry in complexity economics.

These examples demonstrate that complexity economics can provide a valuable theoretical background for examining complex interdependencies.

Efficiency within complexity

In the neoclassical economics, efficiency is classically defined as the optimal allocation of scarce resources to maximise social welfare, often characterised by Pareto efficiency and market equilibrium (Arrow, 1951; Debreu, 1959). This framework relies on assumptions of perfectly rational agents, complete information, and perfectly competitive markets–conditions under which markets are expected to clear efficiently without external intervention. Complexity economics, however, questions these idealised benchmarks by recognising that real economic systems are dynamic, adaptive, and composed of heterogeneous agents who face information limitations and uncertainty (Arthur, 1999).

Efficiency in the context of complexity economics is not a static state but an emergent property arising from ongoing interactions and feedback loops within the system (Holland, 1995). Instead of a single optimal outcome, complexity economics highlights the importance of system resilience, adaptability, and innovation capacity as alternative notions of "efficiency". For example, an economic system may sacrifice short-term allocative efficiency to maintain diversity and flexibility, thereby enhancing its long-term survival and ability to respond to shocks. This broader concept of efficiency accommodates path dependence, nonlinearities, and multiple equilibria, offering a more realistic lens for analysing economic phenomena such as financial crises, technological change, and institutional evolution.

Neoclassical economics distinguishes between allocative efficiency (the optimal distribution of resources according to consumer preferences), productive efficiency (producing goods at the lowest possible cost), and dynamic efficiency (the optimal innovation and adaptation over time). These forms of efficiency are typically analysed under equilibrium assumptions, assuming entirely rational agents and perfect information.

Complexity economics redefines efficiency by focusing on a system's ability to adapt and evolve rather than on achieving a fixed optimal state.

1. Allocative efficiency in complex systems emerges as an emergent property, resulting from the decentralised interactions of heterogeneous agents with limited information rather than from a central planner or perfect competition (Epstein, 2006). While markets may not achieve static Pareto optimality, they can still generate effective resource distributions that evolve in response to changing conditions.
2. Productive efficiency is influenced by firms' adaptive behaviours, learning processes, and innovation dynamics. Rather than instantaneously minimising costs, firms experiment with production methods and organisational

routines, thereby contributing to the evolution of productivity frontiers (Beinhocker, 2006).

3. Dynamic efficiency gains prominence in complexity economics as economies continually explore new technologies and organisational forms. The balance between exploration (innovation) and exploitation (efficient use of current resources) is a core tension. Overemphasis on static efficiency may inhibit innovation, reducing long-term growth and resilience (Holland, 1995).

Agent-based models illustrate how local decision-making rules and network effects produce system-level efficiencies without requiring centralised optimisation (Tesfatsion & Judd, 2006). These models underscore the significance of feedback loops, institutional constraints, and behavioural heuristics in shaping economic performance over time.

Efficiency in the chapters of the monograph is understood in various ways, depending on the theoretical context (neoclassical, behavioural) and the field of study being analysed. In the neoclassical economics (Chapter 2), grounded in welfare economics and allocation theory, efficiency is most commonly identified with Pareto optimality (PO). While desirable from the perspective of efficiency, Pareto optimality does not in itself guarantee fairness. There may even be a conflict between fairness (measured by the absence of envy) and efficiency. A given allocation can be efficient (PO) without being envy-free (EF), and vice versa. Prioritising EF may thus require sacrificing static efficiency. In the analysis of market structure (Chapter 6), particularly in the context of the electric vehicle (EV) industry, efficiency is classified and interpreted as a property dependent on market context and structure (such as an oligopoly).

Hence, we observe an evolution in the understanding of efficiency—from static optimisation (PO) within neoclassical economics and the traditional distinction between allocative, productive, and dynamic efficiency towards dynamic adaptation and resilience in the framework of complexity economics.

Mapping the next frontier

The essays in this volume exemplify a trend toward methodological and conceptual pluralism in microeconomics. They demonstrate how formal modelling can be enhanced by incorporating behavioural assumptions, empirical grounding, and interdisciplinary insights. This pluralism is not a rejection of rigour but a redefinition of what rigour means in the face of real-world complexity. It also reflects the growing demand for microeconomic research that is not only theoretically sound but also relevant to public policy and societal challenges. Topics

such as environmental sustainability, demographic shifts, and technological disruptions require analytical tools that can handle uncertainty, diversity, and institutional embeddedness.

In summary, the future of advanced microeconomics lies in deepening our understanding of how real agents make decisions, how those decisions interact within complex systems, and how institutional contexts shape economic behaviour. The chapters in this volume provide valuable starting points for that journey. By embracing complexity, bounded rationality, and institutional realism, microeconomics can remain both analytically robust and socially meaningful. We hope that this monograph not only contributes to current debates but also inspires further research that pushes the boundaries of economic thought.

References

Arrow, K. J. (1951). *Social choice and individual values*. Wiley.

Arrow, K. J. (1962). The economic implications of learning by doing. *The Review of Economic Studies*, *29*(3), 155–173. https://doi.org/10.2307/2295952

Arthur, W. B. (1999). Complexity and the economy. *Science*, *284*(5411), 107–109. https://doi.org/10.1126/science.284.5411.107

Beinhocker, E. D. (2006). *The origin of wealth: Evolution, complexity, and the radical remaking of economics*. Harvard Business Review Press.

Colander, D., Holt, R., & Rosser, J. B. (2004). The changing face of mainstream economics. *Review of Political Economy*, *16*(4), 485–499. https://doi.org/10.1080/0953825042000256702

Debreu, G. (1959). *Theory of value: An axiomatic analysis of economic equilibrium*. Yale University Press.

Epstein, J. M. (2006). *Generative social science: Studies in agent-based computational modeling*. Princeton University Press.

Gigerenzer, G., & Todd, P. M. (1999). *Simple heuristics that make us smart*. Oxford University Press.

Holland, J. H. (1995). *Hidden order: How adaptation builds complexity*. Addison-Wesley.

Jehle, G. A., & Reny, P. J. (2011). *Advanced microeconomic theory* (3rd ed.). Financial Times Prentice Hall.

Kahneman, D. (2011). *Thinking, fast and slow*. Farrar, Straus, and Giroux.

Kahneman, D., & Tversky, A. (1979). Prospect theory: An analysis of decision under risk. *Econometrica*, *47*(2), 263–291. https://doi.org/10.2307/1914185

Kornai J. (1973). *Anti-Equilibrium. Teoria systemów gospodarczych. Kierunki badań*. PWN.

Miller, D. W., & Starr M. K. (1969). *Executive decisions and operations research* (2nd ed.). Prentice-Hall of India Private Limited.

Neumann, J. von, & Morgenstern, O. (1944). *Theory of games and economic behavior*. Princeton University Press.

Simon, H. A. (1955). A behavioral model of rational choice. *Quarterly Journal of Economics*, *69*(1), 99–118. https://doi.org/10.2307/1884852

Simon, H. A. (1962). The architecture of complexity. *Proceedings of the American Philosophical Society*, *106*(6), 467–482.

Tesfatsion, L., & Judd, K. L. (Eds.). (2006). *Handbook of computational economics: Agent-based computational economics* (vol. 2). Elsevier.

Varian, H. R. (1992). *Microeconomic analysis* (3rd ed.). W. W. Norton & Company.