

Preface

Modern evolutionary economics is now roughly two decades old and, in 1999, we decided that it was time to reflect upon what has been achieved and to explore the new directions that research in this field is likely to take in the new millennium. To this end, we decided to organize an intensive international workshop to evaluate 'work in progress' and to highlight the 'frontier' issues that now confront evolutionary economists. We invited a group of very distinguished evolutionary economists to join us at the University of Queensland in Brisbane, Australia, in July 1999. The workshop was designed to be highly interactive: some participants presented full papers and others responded with challenging and insightful commentaries that facilitated the extended group discussions that followed. This book is the product of these deliberations.

Unlike many books that come under the label of 'evolutionary economics', this one devotes very little space to critiques of 'neoclassical economics'. Instead, evolutionary economics itself is subjected to scrutiny and is found to be deficient in a number of respects. However, its critics are invariably constructive, offering a range of insightful suggestions as to the shape and direction of future research. A key development that can be discerned in the book is a shift in focus away from a traditional concern with selection mechanisms towards a preoccupation with the manner in which novelty and variety provide fuel for such mechanisms. This has drawn many evolutionary economists into the modern complexity science literature that attempts to provide an understanding of how and why 'complex adaptive systems' engage in processes of self-organization. The goal is to provide an integrated analysis of both selection and self-organization that is uniquely economic in orientation. What this means, in practice, is that considerations pertaining to the nature of human knowledge and the unique character of economic organization must be taken into account in an explicit manner.

The book commences with our own brief overview of many of the key achievements, dilemmas and challenges in evolutionary economics at the present time. Part I of the book, which deals with theoretical perspectives, begins with a chapter in which Richard Nelson, one of the seminal contributors to the modern evolutionary approach in economics, expresses the view that it is time to seek more formal ways of dealing with institutional change,

in addition to technological change, if we are to obtain a full understanding of economic evolution. In his commentary, John Gowdy argues that a shift of focus towards institutions may be highly problematic because it leads to questions that cannot be formalized in the context of an individual or a firm as the answers often lie in the field of cultural anthropology. In Chapter 3, Bart Nooteboom follows up these comments by stressing the importance of social constructions, such as language, in the generation of the novelty and variety that give rise to the routines that are subject to selection in the Nelsonian approach. It is argued that, to understand such processes, learning must not be separated from selection but, rather, it is necessary to understand how they interact to generate new novelty. Paolo Ramazzotti raises a number of difficulties with Nooteboom's 'exploitation–exploration' cycle theory of learning and selection sequences that arise because of the openness of systems and their resultant complexity.

The issue of complexity is the theme of Chapter 4, where Robert Delorme asks whether we can theorize in the presence of complexity. Different forms of complexity and associated definitions of 'rationality' are proposed. It is made clear that questions concerning the nature of knowledge are fundamental not only in evolutionary economics but also in the discipline as a whole. In his commentary, Drew Wollin warms to this theme and, sharing Delorme's enthusiasm for the systemic insights of Herbert Simon, argues that simple theorizing is possible in the presence of complexity provided that we are careful to adopt an appropriate methodology. One of the ways in which complexity has been dealt with in the natural sciences has been through the distinction between organized and disorganized complexity. The former is derived from processes of self-organization that may be the outcome of selection or can be viewed as a distinctive, but compatible, part of the evolutionary story. In Chapter 5, Pavel Pelikan argues that it is essential in considering economic evolution that selection and self-organization are dealt with together, and he suggests an analytical framework suited to this task. Bryan Morgan, although generally sympathetic to this theme, argues that there is too much emphasis on the use of a Darwinian selection mechanism analogy in Pelikan's approach, arguing that it is necessary, in the economic domain, to acknowledge the importance of human intentionality. Like Wollin, he argues that thinking in terms of 'complex adaptive systems' provides a more useful way of approaching economic selection and self-organization in this regard.

In Chapter 6, Kurt Dopfer raises a key question concerning theorizing: to what extent does it interface with historical experience and, therefore, be rendered useful in empirical endeavours? He reminds us that the problematic nature of abstract, timeless theories in this regard is not confined to neoclassical economics – evolutionary economics also contains theories that deal only with outcomes and not historical processes. Dopfer offers a 'hisonomic'

approach to theorizing that allows, explicitly, for historical context. It is an approach that is drawn from the complexity perspective of self-organization theory, focusing upon the manner in which both development and discontinuous transitions occur in historical sequences. In his commentary, Jason Potts further stresses the fact that the historical approach relates to complex systems and he goes on to argue that the analysis of spatial hyperstructures, using, for example, a graph theoretic approach, can provide a formal theoretical framework in which historical context dependence can be dealt with.

In Part II of the book, we deal with empirical perspectives. In evolutionary modelling, replicator dynamics have come to be the preferred vehicle for simulating economic selection mechanisms. Paolo Saviotti has been one of the pioneers in this field and, in Chapter 7, he examines how qualitative change in a multisectoral system can be incorporated in the replicator dynamic approach. This is an important development because it deals with the generation of the new variety that fuels competitive selection and, thus, allows self-organization to gain expression in an empirical model of economic evolution. In Chapter 8, Uwe Cantner and Horst Hanusch continue on this empirical theme by considering how we can measure heterogeneity and its dynamics. This has constituted a decade-long research programme. Extensive empirical insights have been gained and explicit links have been forged with evolutionary theory. Attention is focused upon total factor productivity at different levels of aggregation and examples are provided of empirical studies of evolutionary change that have been undertaken. In his commentary, John Nightingale provides a careful critique in which he raises both methodological and measurement issues. His comments concerning the pitfalls and difficulties in this kind of research highlight the pioneering nature of Cantner and Hanusch's research programme.

In Chapter 9, Francisco Louçã moves on from questions on how to deal with variety and heterogeneity in the empirical domain to look at the measurement of complexity in a more general sense. He discusses how complexity leads to the presence of non-linear dynamic features in time-series data with attendant difficulties for conventional statistical methods. It is pointed out that, although we cannot predict how such series will behave if non-linearities are present, it remains possible to understand the structure of historical flows and identify critical points, that is, transitions. Louçã sees this as bringing back history into economics and, in this respect, his approach is very compatible with that of Dopfer in Chapter 6. In his commentary, Steve Keen is generally supportive and adds some historical and methodological weight to the arguments made. He points out that many economists, in largely rejecting non-linear dynamic perspectives on modelling, because of the interpretative and predictive difficulties that they raise, are falling well behind natural scientists, with important implications for the scientific status of economics.

In Chapter 10, we are introduced to a modelling approach that deals explicitly with emergence and evolution, building on the view that organizational structures in the economy are complex adaptive systems. Peter Allen has been at the forefront of this type of modelling for two decades. For much of that time, evolutionary economists did not pay enough attention to his path-breaking work simply because it did not focus upon the operation of selection mechanisms but, rather, entailed a broader conception of the dynamics of complex systems. In this chapter, he reviews his carefully developed approach to evolutionary modelling and considers how knowledge and learning can be dealt with in his analytical structure. This chapter is important because it brings together many of the theoretical and empirical issues discussed throughout this book in a coherent modelling approach that is designed to address important policy questions. The commentator in this chapter is Kevin Bryant, an experienced policy analyst, who provides a wide-ranging evaluation of Allen's approach and finds it very congenial. However, he confirms that the complex adaptive systems approach was much less familiar to him, compared to Nelsonian evolutionary economics prior to the workshop, and thus is still at the 'frontier' in the policy arena. In Chapter 11, Bryant goes on to evaluate the usefulness of evolutionary economics, more generally in formulating innovation policy. It is striking just how well suited evolutionary economics is to this task which, in a sense, is not surprising given that it was a preoccupation with the determinants and effects of innovation that stimulated modern evolutionary economic ideas in the first place.

Finally, having introduced the contributors to the book and its main themes, it remains for us to acknowledge the contributions of those who made this book, and the associated workshop, possible. First of all, we would like to thank Amy Lindley for all her organizational efforts, both in making the workshop a success and in coordinating the book project. Thanks are also due to Kevin Bryant for his strong support from the beginning of the project – we hope that it will make a lasting contribution to Australian technology and innovation policy. We would also like to thank the following organizations for their material support, without which this book would not have been written: the Australian Department of Industry, Science and Resources; Queensland Treasury; Research Services, University of Queensland; School of Economics, University of Queensland. The contribution of the Economic and Social Research Council of the UK is also acknowledged gratefully, through their support of the Centre for Innovation and Competition at the University of Manchester.

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