

**Evolutionary Economics**



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## **Post-Schumpeterian Contributions**

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**Pinter Publishers**  
**London and New York**

Distributed in the United States and Canada by  
St. Martin's Press

**Pinter Publishers Ltd.**

25 Floral Street, London WC2E 9DS, United Kingdom

First published in 1994

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Distributed exclusively in the USA and Canada by St. Martin's Press, Inc., Room 400, 175 Fifth Avenue, New York, NY10010, USA

**British Library Cataloguing in Publication Data**

A CIP catalogue record for this book is available from the British Library

ISBN 1 85567 042 9

**Library of Congress Cataloguing-in-Publication Data**

A CIP catalogue record for this book is available from the Library of Congress

Typeset by Department of Business Studies, Unirversity of Aalborg  
Printed and bound in Great Britain

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## Preface

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This book concentrates on core elements of the new evolutionary economics, especially the elements covered by what may be called Artificial Economic Evolution. But it also relates to the more general revival of studies on economic and technological evolution, and thus to the fact that many researchers today have accepted Schumpeter's (1942/87, 82) proposition that the 'essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process.' The difficult tasks have been to visualise and analyse such a process, to move from the mainstream studies of 'how capitalism administers existing structures' to the more difficult studies about 'how it creates and destroys them.' (p. 84) In performing these tasks modern economists have access to analytical tools that were non-existent when Schumpeter developed his 'magnificent dynamics' (Baumol). We now have the possibility of treating complex evolutionary processes with an increasing degree of clarity and rigour. At the same time we have to recognise a danger that Schumpeter's insights are ignored just as are the works of other pre-war contributors to the study of economic evolution. There is also a danger that the evolutionary-oriented studies of some economic historians like Chandler disappear from the analytic horizon of evolutionary-economic researchers.

To avoid the crowding out of evolutionary economics, this book presents major tools and results of new evolutionary economics in the context of a larger evolutionary-economic research programme which can more or less clearly be found in Schumpeter's work. In such a context, the present ability to cope with evolutionary processes is fully recognised. However, the ability to synthesise mechanisms concerning the creation, transmission, and selection of behavioural rules into computer-based studies is only a very first step on the way towards a real understanding of the processes of capitalist and post-capitalist evolution. There is also a need for a second synthesis, a synthesis between broad and descriptive accounts of economic transformation and the clear-cut analysis of artificially limited evolutionary processes. The book tries to demonstrate that a viable new evolutionary economics may be defined in terms of these two types of syntheses.

The scope of this book is quite broad and it exploits different sides of my previous work in such diverse fields as economics, biology, and computer science, which all have influenced the way in which I see evolutionary economics. More or less by accident, my diverse interests appear to be rather important to research work in evolutionary economics but the reader should, of course, be aware of the possible biases in my approach to the area. Even within the economic literature there are clear biases which mainly spring from the attempt to create a kind of 'dialogue' between Schumpeter and new evolutionary economics. However, even within my

chosen area, I have had to make severe delimitations. One of the remaining tasks is to rethink important parts of industrial economics or industrial organisation from Bain (1956) to Tirole (1988), a body of literature which is beyond the limits of the present book but within the realm of important inspirations to evolutionary economics.

The introductory chapter 1 concerns to a large extent the broader issues which have been suggested above; at the same time it gives a condensed progress report on evolutionary-economic analysis. Much of the exposition deals with what I consider to be four major characteristics of a viable new evolutionary economics: population thinking, empirical orientation, an algorithmic approach, and a relationship to old evolutionary economists (like Schumpeter). In chapter 2 I turn to a reconstruction of Schumpeter's schemes of routine and innovation. Here I deal with the idealised measurement of the application of routines which leads to precise definitions of evolution and non-evolution. These definitions are used to describe Schumpeter's overall scheme of what may be called 'punctuated evolution', i.e. an evolutionary process which once in a while is punctuated by the emergence of relative stasis in the economic routine system. The individual routines and the jump-wise renewal of them which is presupposed by Schumpeter is then dealt with in terms of 'economic or techno-economic paradigms'. I suggest that the major source of stability in the routine system should not be sought within the individual economic units but in the interfaces between them, defined by their repeated transactions. All in all, the chapter emphasises a number of areas of central relevance to Schumpeterian thought and analysis which have not yet been explored by modern evolutionary economics.

The three following chapters deal with modelling work performed around and within new evolutionary economics; especially they deal with the development of the algorithmic approach of Artificial Economic Evolution (an expression which suggests some positive and negative analogies and relationships *vis-à-vis* Artificial Intelligence). In chapter 3 it is demonstrated how the modern studies can help to explore many of the patterns revealed by Schumpeter's case of 'railroadization'. Especially, it is shown how the S-curve approach to the study of the diffusion of innovations can be extended to deal with the 'ecological' interaction between the application of different routines. Furthermore, some ways of using the S-curve to explore pioneering and crowding strategies are suggested. In chapter 4 Nelson and Winter's early and important studies of evolutionary-economic processes by means of computer models are dealt with. These models helped to make a synthesis between the theories of rule-based behaviour, the old Schumpeter's ideas of the innovative activities of firms, and the ordinary economic account of the market as a selection mechanism. In this way they were able to simulate processes in which innovators and imitators interacted in a process of 'Schumpeterian competition'. In chapter 5 more abstract evolutionary processes emerging from an iterated Prisoner's Dilemma game with limited information are dealt with. The experimentally oriented approach developed by Axelrod in his analysis of the evolution of cooperation is emphasised and the introduction of new variety into the game is explored in terms of the so-

called genetic algorithms. Some new aspects of this area of studies emerge from a reinterpretation of the game as a Trader's Dilemma. The general applicability of such a kind of Artificial Economic Evolution is emphasised in a final section on rule-based systems and genetic algorithms. Chapter 6 contains a short statement of the proposed research programme which is embodied in the structure of the book, as well as in its ambition to promote a modern evolutionary-economic synthesis.

The different chapters of the book do not cover the full scale and scope of recent contributions to the rather confusing area of evolutionary economics (see, e.g., Saviotti and Metcalfe, 1991; Witt, 1991b; 1992a, 1993; Foray and Freeman, 1993; Day and Chen, 1993; contributions to the *Journal of Evolutionary Economics*, 1991 ff.). To me it has been more important by means of the algorithmic approach to present and rethink a set of near-classic themes and models. Through an exposition, which relates to, e.g., Schumpeter, Goodwin, Nelson & Winter, and Axelrod, I hope to help new researchers to enter the field of evolutionary economics without an immediate lock-in to a specific modelling trajectory. I believe that such an exposition of major types of models will not only encourage the reader to develop these classic contributions but also to confront alternative proposals. The bias of the book is rather related to its algorithmic approach which may appear to encourage researchers to neglect a formalised, deductive approach to evolutionary processes. But the bias is the result of a necessary specialisation of the present book, and does not reflect a general advise to jump from standard-mathematical to computer-science analysis. I believe that evolutionary economics cannot be developed broadly without the interaction of formal and algorithmic approaches. In this respect, the book cannot stand alone but should be supplemented with works which emphasise a standard mathematical approach to evolutionary economics (see the literature listed above).

There is no chapter with 'policy conclusions'. Policy conclusions should not be made at the beginning of a research programme but as an outcome of its results. However, there is so much confusion about the policy relevance of evolutionary economics that a few remarks are relevant: Often it is said that evolutionary analysis gives no policy conclusions other than *laissez faire*. At other times it is suggested that this conclusion should be supplemented with harsh conservatism. This is not necessarily so! Evolutionary analysis may help the most powerful firms as well as the 'countervailing forces'; it may enlighten supply-side economics as well as post-Keynesian employment policies; it may be used in the competition between national systems of innovation but also in a new type of development policy which includes environmental concerns. These statements have necessarily a postulating character. Let me, therefore, quote the opinion of the central authority in the field. In his preface to *Business Cycles* Schumpeter emphasised:

What our time needs most and lacks most is the understanding of the process which people are passionately resolved to control. To supply this understanding is to implement that resolve and to rationalize it. This is the only service the scientific worker is, as such, qualified to render. As soon as it is rendered everyone can draw for himself the practical conclusions appropriate to his individual interests or ideals. And it will be seen ... that my analysis can in fact be used to derive practical conclusions of the most conservative as well

as the most radical complexion, exactly as one and the same body of engineering or medical knowledge can be used for the most varied purposes. [/] But scientific analysis of an organic process easily creates the impression that the analyst ‘advocates’ letting the process alone. ... [However,] my analysis lends no support to any general principle of *laissez faire* ... (Schumpeter, 1939, vi)

These words are well-taken. Even if an analysis often creates the impression that the author ‘advocates’ the evolutionary tendencies which are treated. However, no such connection exists. Actually, there is a huge gap between the Scandinavian-type context of the present author and the Hapsburg-empire setting in which Schumpeter developed many of his views.

Now to a few practical issues: The reference system of the book emphasises collections of papers in order to ease the reader’s way through the very heterogeneous literature. However, the dating of the articles is important for several purposes. Therefore, Alchian (1950/93) refers to a paper from 1950 reprinted in Witt (ed.), *Evolutionary Economics*, 1993; similarly, Winter (1984/91) is found in Wood (ed.), *J.A. Schumpeter: Critical Assessments*, 4 vols., 1991. I also use this method of citation for indicating the date of both the original edition and my edition of a monograph.

The present book does not include all the material produced in my related research projects on Schumpeter and evolutionary economics. In respect to this research programme the present work on ‘Evolutionary Economics: Post-Schumpeterian Contributions’ represents a second part. It can be thought of as preceded by a ‘part I’ which includes studies which interpret Schumpeter as a special-type evolutionary economist (including Andersen, 1991b, 1991c, 1991d, 1991e, 1992b, 1993a, 1993b, 1993d). It is followed by a metaphorical ‘part III’ which includes studies which apply evolutionary-economic concepts and schemes of analysis to such areas as product innovation and quality control as well as national systems of innovation (Andersen, 1991a, 1992a, 1993c). To the extent that these materials have not yet been transformed into publications, they are available for interested researchers.

Some of the work presented in the present book was made possible by a one-year senior scholarship financed by the University of Aalborg. For the rest of the period I have used parts of my research time as an associate professor (and parts of my evenings and nights). The work has been associated with the research work of the IKE Group on the economics of industrial, technological and institutional change, Department of Business Studies (earlier: Institute of Production), University of Aalborg as well as to the PhD programme in Technology Policy, Innovation and Socio-Economic Development, Department of Economics and Planning, University of Roskilde.

In the development of different parts of the book I have had helpful comments from or discussions with many researchers, although I have the sole responsibility for the final result. I especially thank Jan Annerstedt, Jerome Davis, Claus Emmeche, Jan Fagerberg, Chris Freeman, Ole Hyldtoft, Björn Johnson, Christian Knudsen, Kristian Lindgren (permission to use figures 5.2 and 5.3), Bengt-Åke Lundvall, Stan Metcalfe, Erik Mosekilde, Jørgen Østergaard, Keith Pavitt, Jørgen Lindgaard Pedersen, Georg von Wangenheim, Ulrich Witt, and the PhD students in economics

and technical change at the Universities of Roskilde and Aalborg. Dorte Køster has helped me to organise the project. Maureen McKelvey has corrected my English in most of the book, and she has also helped to sharpen up several arguments. Similar help with language and arguments was given by my father, Bent Andersen, who died before the book was completed. The book is dedicated to his memory.

