The Sources of Economic Growth

Richard R. Nelson

Cambridge, Mass., Harvard University Press, 1996, vi + 328 pp., US$39.95, ISBN 0 674 82145 9

As stated in its introduction, this book 'brings together a collection of essays on economic growth, technical advance as the driving force behind economic growth, and the social institutions that mold technical advance and in turn are modified as essential part of the economic growth process' (p. 1). It does so from the perspective of Schumpeterian evolutionary theory. However, 'theory' in this book is purely 'appreciative', i.e. descriptive or verbal theory. The book does not contain a single mathematical formula. This is in strong contrast to the highly formal modelling which is a feature of both old and new neoclassical growth theory, as well as the author's own formal modelling efforts published elsewhere.[1] Appreciative theory is much closer to the underlying complexity of the 'real world', capturing many more of the relevant variables and interactions than formal theory could ever hope to. However, the neglect of even a minimum of formal modelling seems to be due more to the influence of the editor than the author (p. 5). The author regards both formal and appreciate theory as necessary and argues that they have to work together to advance our understanding of technical change and economic growth. He hopes that the book will provide a bridge between the two (p. 6).

The book consists of an introduction and four major parts, which contain ten previously published essays. Only about eleven pages are new material, serving as brief introduction to the major themes. The earliest essay was originally published in 1962, the latest in 1994, though seven of the essays are dated 1990 or later.

Part I of the book provides an introduction to the author's evolutionary perspective. First, it contains a well known *Journal of Economic Literature* article, first published in 1981, which critically surveys the neoclassical approach to the analysis of productivity growth. Some of the shortcomings mentioned have since been addressed by subsequent developments in growth theory, i.e. parts of the essay are somewhat outdated by now. However, the essay still provides a powerful antidote to standard neoclassical theory, and Nelson's major and fundamental criticisms are still valid and have so far gone largely unanswered by formal theory. This essay should be read by anyone interested in the modelling of economic growth.

The second essay introduces the main elements of the author's evolutionary theory of technical and institutional change and discusses the changing nature of the 'capitalist engine of progress'. It begins by pointing out the shortcomings of Schumpeter's original view of technological change, in particular its neglect of the complex interrelationship between technology and science, as well as the complex set of institutions involved in their advance. The author fills in the missing elements, discussing the roles of industrial R&D labs, universities, interfirm cooperation, and government R&D support.

Part II contains three essays on Schumpeterian competition, defined as competition among firms through innovation. Chapter 3 is another exercise in 'what Schumpeter really said' and how he has been misinterpreted. It critically assesses Schumpeter's influence on subsequent economic research on innovation. The author argues that Schumpeter never had in mind what later became to be known as the 'Schumpeterian hypothesis', and ponders about his contribution to evolutionary economics. This provides the background for the development of Nelson and Winter's influential Schumpeterian evolutionary theory of economic change.

The next essay is a critique of how neoclassical theory deals with differences amongst

firms. It is argued that there has to be room for a theory that allows for discretionary firm differences, i.e. differences emerging from different choices firms make that face the *same* environment. The author then goes on to discuss the relationship between organisational and technical change, arguing that the uncertainties about the former are even greater than those about the latter, making the conventional 'rational choice' view even more untenable. Nelson sees organisational change as a handmaiden to technological change. This is similar to Chandler's position. However, it should be pointed out that this has been severely criticised by North in his attempt to integrate institutional and technological change.[2] Nelson regards the study of the co-evolution of technology and the wide range of institutions represented in an economy as a promising area for further research.

Chapter 5, which is co-authored with Robert Merges, focuses on the question of how broad property rights ought to be. It is argued that especially in the case of inventions that open up prospects for future follow-up inventions (i.e. cumulative systems technologies) a broad patent scope will stifle technical progress by decreasing the degree of rivalry. The authors discuss some interesting historical case studies and current high profile cases (e.g. modern biotechnology). The chapter provides valuable insights into the complex inter-relationships between patent policy and technological progress.

Part III contains three essays on the role of science in technical advance. The first of these deals with supply side factors, focusing on the role of knowledge as capability to guide R&D activity. The discussion of 'knowledge capital' is somewhat outdated in light of subsequent developments, but the essay raises a large number of issues with are in need of further analysis. Chapter 7 contains Nelson's 1962 case study of the development of the transistor at the Bell Telephone Laboratories. One of the major lessons derived from it is that the distinction between basic and applied research is very fuzzy.

Chapter 8 deals with the role of US universities in technical advance in industry. It is co-authored with Nathan Rosenberg. I found this chapter one of the most interesting of the book, given current policy debates in many countries about the appropriate role of universities in society. It should be read by anyone interested in the subject looking for a balanced perspective on the notion that there should be closer ties to industry. Arguing from a detailed historical account, the authors provide a differentiated picture, pointing out the likely opportunities as well as limitations of enhanced university industry research links.

The two chapters in Part IV have an explicitly international perspective. Chapter 9, co-authored with Gavin Wright, discusses the perceived rise and fall of US technological leadership and puts the post World War II era in historical perspective. The authors point out the factors which differentiated the US from other countries, and the subsequent forces eroding its technological leadership. Readers familiar with the formal literature on convergence will recognise the discussion of so-called beta and sigma convergence, but these terms are not used by the authors. Several of the arguments advanced in this essay have in recent years been subjected to empirical analysis, e.g. that policies trying to foster 'techno-nationalism' don't work well any more in a world where knowledge cannot be prevented from spilling over to other countries. This testifies to the role appreciative theory has in highlighting the important issues. I agree with the authors that it seems more fruitful to focus further convergence analyses on the factors that have brought about convergence amongst the OECD countries since the end of World War II, rather then to refine procedures for testing whether convergence is a universal phenomenon or not.

The final essay highlights some of the more interesting findings of a major international comparative study of national innovation systems coordinated by the author.[3] The aim of that study was to illuminate institutions and mechanisms supporting innovation in the broad sense, to assess the similarities and differences across nations, and

to asses how they seem to matter. It is a prime example of the power of appreciative theorising. The essay begins with a detailed definition of the term 'national innovation system'. The author then takes issue with several influential writers on international competitiveness and innovative performance. The importance of education as a necessary but not sufficient condition for economic growth is highlighted. Policies directly aimed at technological advance are found to be very diverse, making generalisations in this areas impossible. The chapter also focuses on the dispute over high-tech policies and the importance of high-tech industries in general, and discusses the relevance of the national innovation concept in the age of globalisation.

To sum up, the essays in this book testify to Nelson's life-long struggle against the limitations of mainstream theoretical economics and in support of an evolutionary theory of economic growth guided by a large dose of appreciative theorising. However, one does not have to be an evolutionary economist to value appreciative theory. For example, Romer, who is credited with initiating new growth theory in the 1980s, also regards descriptive theory as necessary to help model builders pin down the important causal relationships and feedback mechanisms to guide formal modelling.[4]

It has been a great pleasure to read (or re-read) the essays contained in this book. The wealth of useful information and appreciative theorising contained in them is a welcome contrast to much of the formal literature on the subject of technological change and economic growth. It provides many insights that help put current policy debates about economic growth, the role of universities, science and technology policy and related issues into perspective.

Notes and References

1. The best known of the latter is the influential book by Richard Nelson and Sidney Winter *An Evolutionary Theory of Economic Change*, The Belknap Press of Harvard University Press, Cambridge, MA, 1982, which combines formal and appreciative theory.
2. Alfred D. Chandler, Jr., *The Visible Hand: The Managerial Revolution in American Business*, The Belknap Press of Harvard University Press, Cambridge, MA, 1977; Douglass C. North and John J. Wallis, 'Integrating Institutional Change and Technical Change in Economic History: A Transaction Cost Approach', *Journal of Institutional and Theoretical Economics*, 150, 4, 1994, pp. 609–24.
3. Richard R. Nelson (ed.), *National Innovation Systems: A Comparative Analysis*, Oxford University Press, New York, 1993.
4. Paul Romer, 1993, 'Idea Gaps and Object Gaps in Economic Development', *Journal of Monetary Economics*, 32, 1993, pp. 543–73.

Hans-Jürgen Engelbrecht
Massey University
Palmerston North, New Zealand

Knowledge, Technology Transfer and Foresight

Annamária Inzelt and Reinhard Coenen (Eds)

Dordrecht, Kluwer, 1996, xvii + 250 pp., US$149.00, ISBN 0 792 34274 7

This book is a selection of papers presented at the NATO Advanced Research Workshop with the same title held in Budapest, Hungary in October 1995. It is also the eighth volume of NATO's ASI (Advanced Science Institutes) Partnership Series on Science and Technology Policy. One of the aims of the workshop had been to bring together researchers in the field of natural and social sciences from around the world, including