

# Technological change enhancing productivity and economic growth

## The Economic Theory of Invention and Innovation

edited by Albert N. Link

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One criticism of many research papers (and the research field of innovation is not immune from this deficiency) is that they are not sufficiently grounded in theory. Therefore, Albert N. Link's edited contribution to the *International Library of Critical Writings in Economics* is particularly welcome. The volume, which is structured in five parts, brings together practically all the key writings on the economics of invention and innovation – in other words, the seminal articles that have laid the groundwork for contemporary research in the field.<sup>2</sup> I will not attempt to summarize all these articles, but provide below a broad review of this book and identify some genuine highlights.

Academics who are teaching and/or writing in the field will, as a result, find the book of particular utility in understanding its development and, indeed, it is potentially magnificent as a tool to

deepen students' knowledge of the economics of invention and innovation.

In his introductory chapter, Link rightly emphasizes that technological change enhances productivity growth (and economic growth) and 'ultimately leads to an improvement in the quality of life' (p ix), which is thus important from a policy perspective. These aspects are the rationale for the book and the importance of the subject area, and Link makes an important distinction, noting that we should:

'think of an invention as the creation of a new technology. Innovation, then, is the first application of the invention – the technology – in production.' (pp x– xi)

An important distinction is whether an invention and/or innovation is (a) exogenous (outwith an organization or

unexplained: Part I), such as technical change in the 'aggregate production function' (Solow, 1957) or disaggregated into 'an inter-industry and intra-industry component' (Massell, 1961); (b) induced ('purposive' rather than unexplained: Part II), which is, for example, well complemented by Ahmad's (1966) theory and Fellner's (1971) empirical support; or (c) endogenous (within: Part III), such as Hébert and Link's (2006) chronology of the entrepreneur as an innovator. The articles in the first three parts provide a broad basis for understanding the theoretical underpinnings of exogenous, induced and endogenous innovation.

Of great interest to this reviewer, given the rising interest within enterprise and innovation pedagogy of experiential learning, is one of the final articles in Part III on the 'learning by doing' aspect of innovation (Arrow, 1962), which leads nicely into Part IV (sources of innovation), with Cohen and Levinthal's (1989) classic article on innovation and learning within the R&D process, described as its 'two faces' and the concept of 'learning before doing' in developing new process technology (Pisano, 1996). Kamien and Schwartz (1971), also in Part IV, are notable for their fascinating study of risky R&D projects' expenditure patterns – an issue still relevant today, particularly for those financing high-risk R&D (assuming such investors are not foolhardy enough to use financial risk modelling, as major banks have done to

their – and our – misfortune). Finally, Part V brings together six articles providing great insight into the adoption and diffusion of innovation – there are, for example, papers on the rate of imitation (Mansfield, 1961) and on factors influencing technological diffusion (Rosenberg, 1972). Meanwhile, Arrow (1969) reviews the production and transmission of knowledge and offers this gem:

‘My guess is that economic factors have little to do with bias in technological progress (though they may have a good deal to do with its magnitude). European desire for spices in the late fifteenth century may have had a good deal to do with motivating Columbus’ voyages, but the brute, though unknown, facts of

geography determined what in fact was their economic results.’ (Arrow, p 35)

Because of Link’s fine pedigree in the field, I do not feel there are any significant omissions – though given that the earliest article in the volume is that by Brozen (1953), none of Schumpeter’s seminal papers are included. The choice of articles in this book is almost inspired and is necessarily focused on *economic* studies with an empirical and positivist paradigm (hence the omission of Drucker, 1985). Furthermore, the volume inevitably focuses on products and processes and does not cover the burgeoning field of innovation in services.

Entrepreneurship academics should read this volume, as it will remind them

that ‘corporate entrepreneurship’ or ‘intrapreneurship’ is, in effect, invention and innovation.

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### Note

<sup>1</sup> Full references have been omitted, but can be found on the contents page of Link (2008).

### Reference

Drucker, P. F. (1985), ‘The discipline of innovation’, *Harvard Business Review*, May–June, pp 53–64.