Innovation, Welfare and Industrial Structure: An Evolutionary Analysis

Timothy M. Wakeley

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In this monograph, a simulation approach is adopted to model firm interactions in a process of industrial evolution. The approach is heavily influenced by the work of Richard Nelson and Sidney Winter and other authors who have attempted to incorporate Schumpeterian competition, technological uncertainty and bounded rationality into industry models. The theoretical approach, adopted and operationalised in his algorithms, are viewed by Wakeley are 'adaptively rational' rather than 'omnisciently rational'.

In Chapter 1, a brief plea is made for an evolutionary approach, drawing on a subset of the established literature. Chapter 2 offers an intuitive discussion of the derivation of an output algorithm, drawing upon the insights of both behavioural theorists and evolutionary economists. Basically, it is posited that the firm chooses an output consistent with a market price, other things being equal, which produces a mark-up equal to a satisficing mark-up which is formed adaptively. The main basis of competition is innovation and associated variety. Financing constraints and minimum capital stock decumulations/inventory accumulations provide bounds to firms' output adjustment plans.

In Chapter 3, an attempt is made to build a welfare approach which can be used to compare different evolutionary paths of industrial structure. The main objective is to provide alternatives to a concentration index as a measure of welfare. Several approaches are considered and the one chosen deals with obtaining a satisfactory reference level of costs against which to measure the welfare gains and losses attributable to various sources. This is not an easy task since the bulk of welfare analysis in economics relates to comparative static comparisons rather than dynamic situations. However, I am not convinced that Wakeley offers a satisfactory resolution of this problem, which was raised at the outset in Nelson and Winter's seminal contributions in this field.

In Chapter 4, the simulation model used is summarised briefly (the details of the model are in an appendix). The model has two interacting 'elements': a technology element containing the feasible set of innovations and a representation of imitation possibilities and associated R&D decisions of the firm; a market output element containing the competitive stance of the firm, the output decision and its capital utilisation/investment requirements. The modelling of technological change follows closely the approach adopted by Nelson and Winter, but the modelling of output decisions is very different. The firm is characterised as an 'adaptive organisation' which engages in mark-up pricing in a satisficing manner. Thus, output and capacity utilisation are manipulated in a manner which is not possible in the Nelson and Winter model.

In Chapter 5, the model is simulated. Some discussion of model validation is undertaken. A 'relative forecasting' approach is adopted, whereby validation involves examining the consistency of the model's prediction when different numerical parameters are adopted. Both four-firm and ten-firm runs are undertaken for 100 periods. These experiments are taken to 'have revealed a rich and complex story but drawing conclusions from these results is not a straightforward matter' (p. 88). This is a bit of an understatement—after a careful reading of this chapter, I could not see how Wakeley could argue that the simulations that he has undertaken can be of assistance in policy-making except in a very abstract sense. There are many possibilities, beyond the runs selected, which could characterise real situations—the policy maker would find it

difficult to know which ones exist in the cases that she or he has to deal with. What the simulations do tell us is that 'neoclassical' models should not be used by policy makers under any circumstance! Chapter 6 considers policy intervention in more detail: a theoretical framework is suggested; welfare enhancing policy instruments are suggested; a worked example is used, drawing on the simulations reported earlier in the book. The main conclusion is that nondiscriminatory R&D subsidies should be used to improve the welfare performance of industries by assisting them to move towards their technological frontier. Chapter 7 provides a brief two-page summary of the book.

The research reported in this book should be regarded as a direct development of the approach of Nelson and Winter. However, Wakeley issues a bleak warning in this regard: 'the whole process is extremely time-consuming and others who may wish to follow in the footsteps of Nelson and Winter should take heed of this warning' (p.153). Wakeley has tried very hard to provide an approach which might be of use to policy makers, rather than one which simply assists researchers in examining past experience. However, I feel that what he has actually done is to highlight the weakness of both the Nelson and Winter simulation approach and standard neoclassical approaches.

I doubt very much that Schumpeter himself would have found such an approach appealing and the treatment of technological change and competition chosen is of the type which is strongly rebutted by Austrian economists. Furthermore, it would have been of considerable assistance if he had juxtaposed his simulations against a real-world case or cases so that we could see how the outcomes were reasonable approximations to actual historical experience. Use of a real case can provide much stricter stylised facts, boundaries and calibration requirements. I see no reason why this could not have been done, given the large and detailed literature on innovation processes which exists. The end result would have been a monograph which would have looked like a well-rounded book, rather than a research report dealing with simulations of a preferred algorithm. Furthermore, I did not give the book very high marks for presentation—it is not well organised and there is a great deal of repetition, which should not be necessary in such a short book.

However, having said all this, there are some aspects of this book which may be interesting to industrial economists who construct evolutionary and/or behaviouralist models. Also, a contribution of such modelling lies, not in depicting reality, but in exposing the limitations of theory which deals with analytical, rather than numerical, solutions. Wakeley has added to a growing literature which makes this point.

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For the Common Good: CSIRO and Public Sector Research and Development

Peter Ewer (Ed.)

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It is difficult to work out what this little book is intended to achieve. A collection of essays whose publication has been sponsored by the Community and Public Sector Union, *For the Common Good* concludes that 'the preservation of a strong, publicly controlled scientific organisation is required so that the Australian community retains the means to make