

much too "practical", to be accepted by any of the standard schools with their ideological biases.

His discussion of technology's role in development policy is equally fair-minded, especially regarding the "appropriateness" controversy. Here I do want to harken back, however, to my only criticism of the introductory chapter: If Clark had outlined the general conditions for static and dynamic efficiency, much of his treatment here could have been more hard-hitting. Nevertheless, readers of these chapters should get a clear picture not only of the potentials of economic analysis in contributing to the solution of one of the world's most pressing policy problems, but also of the crucial role of good common sense in the application of such analysis. Looked at in terms of the book's overall educational objectives, the material presented here could also be considered a case study integrating theoretical, institutional, and technical considerations. That the "case" deals with problems of the third world then becomes quite incidental to its pedagogical value.

The final chapter summarizes contemporary issues of science and technology policy, covering such matters as technology-induced, structural unemployment, the planning and control of complex technology, and the evaluation of basic scientific activity. Clark also offers his own conclusions on the current state of social science research into the subject. To a certain degree, he is tilting at windmills. Who among the workers in the field, for example, would quarrel with his judgment that much of mainstream economic theory (which he calls "the ruling paradigm") has little to offer in the way of guidance for an understanding of technological change, and virtually nothing in the way of useful policy advice?

And yet, if one compares the — admittedly not fully developed — heterodox approaches in economic theorizing with the achievements of other disciplines, one cannot help being somewhat more optimistic than the author. The rule of neoclassical orthodoxy has been challenged often enough, and from enough different directions, to suggest that the current, unsettled state of affairs in the discipline may be but the preface to a Kuhnian "paradigm shift". After all this has been said, there remains the fact that Clark's own book is testimony to the usefulness of viewing a very complex set of social, technical, and political phenomena through the economist's looking glass.

Gerhard Rosegger

Case Western Reserve University, Cleveland, Ohio. USA.

Technology, Economic Growth and the Labour Process by *Phil Blackburn, Rod Coombs and Kenneth Green*

(Macmillan, London, 1985), pp.xiv + 239, £ 27.50., ISBN 0-333-37496-7.

This book is an extended essay in the Marxist tradition, summarising and criticising some of the ideas originating from Mandel¹, Braverman² and Aglietta³.

The content can best be comprehended by defining the terms in the title: by 'technology' the authors signify those devices which incorporate useful

knowledge, fixed "...into new manufacturing processes, into new products and into new modes of delivery of producer and consumer services. . ." (p.2).

If the first term of the title is used conventionally, the second and third terms are used in senses unfamiliar to most economists. By 'economic growth' the authors have in mind the alternating periods of expansion and contraction of overall economic activity, first observed by Kondratiev and characterised by "...major technological revolutions in the capital goods industries. . ." (p.7). Long-term economic cycles or long waves of economic activity are conventional terms which come closer to the authors' meaning.

By 'the labour process' the authors refer to "...Marxist accounts of the workings of the capitalist mode of production which focus on those combinations of human labour and technology in particular organizational settings which comprise the heart of production" (p.3). How the labour process changes over the long waves, and particularly how it is likely to change should there soon be another upsurge of economic activity, is the main concern of the authors.

According to the authors, the previous boom period, lasting from the end (beginning?) of World War II through the 1960s, saw the perfection of mass production in those industries manufacturing motor cars, consumer durable items both electrical and mechanical, and petrochemicals (Table 1.1, p.6). The technologies employed were the assembly line, for the first two items, and continuous flow, for the third: the labour process which evolved within the industries is characterised as 'Fordism' (the term is Aglietta's). "Fordism is, in short, a particular configuration of the labour/production process consisting of a sequentially integrated core-periphery system of production incorporating highly prescribed tasks and specialized production machinery, making very large batches of standard products at very high levels of productivity" (p.43). It is the application of knowledge acquired through the time-and-motion studies of Taylor and his followers to the manufacture of goods subsequently purchased and consumed by the masses. Its symbol would be the Model T Ford.

Should a new boom reverberate among us, the authors believe its labour process will be characterised by 'neo-Fordism'. The definition of neo-Fordism is more complicated (see pp.104-6) but includes increased control over manufacturing processes of small as well as large scale, over service activities and over groups or collections of individual processes formerly independent, as well as the organizational changes consequent upon greater control. "Neo-Fordism has three elements: the technological element of control mechanization which permits the mechanization, at higher levels of productivity, of more flexible production of a higher variety of products; the labour-organizational element confers greater choice in the combination of tasks into jobs and work-roles thus moving away from individual repetitive jobs; the informational infrastructure element permits the integration of different productive sub-units by electronic methods" (p.199).

Thus are the authors' terms defined; but the reader of this review may well ask, 'Why devote so much attention to terminology?'. The answer is that terminoloby is what the monograph is about. The first half of the book introduces the terms and their definitions; the second half sees how well these terms, particularly neo-Fordism, apply in the spheres of small-batch engineering and (some) services. The book is thus an exercise in taxonomy.

A conventional economist, which is what this reviewer is, finishes the book with a better understanding of the terms, for they are clearly defined. He also finishes aware that the labour process is generally neglected by students of technical change. His sort of economist asks how invention comes about, how innovation, how diffusion; he asks what changes result in the composition of output, in the structure of industry, in the overall level of economic activity; but he fails to ask how all these changes affect the person who minds the machine, or perches at the work station, or consumes the product, and how, if at all, these persons, in their turn, affect technical change. He devotes attention to the inventor, to the innovator, to the firm, even to the individual scientists and engineers and lawyers and managers. But to workers he devotes no attention, except as they contribute to cost, or to demand.

Nonetheless, this narrow-mindedness of the conventional economist contributes to his strength. Drawing upon the symbol employed by the authors of this book, he is a Fordist, systematically carrying out a prescribed investigation of phenomena of mass interest. The product is a standard item, usable by everyone and, since standardised, capable of being aggregated. From the aggregate, from the assembly of comparable studies, he learns about technical change.

To keep to the language of symbolism, the authors of this book are Fabergéists, producing, with great imagination and by meticulous workmanship, items of intricacy and richness. Not for vulgar use, each is a finished work of art, each is unique. But, to this reviewer, Fabergeism in economics is unrewarding: the effort put into working through a book like *Technology, Economic Growth and the Labour Process* is not commensurate with the knowledge derived. One cannot be certain that if one addressed the same issues, conducted the same argument, one would come out with the same conclusions as the authors. Nowhere is there a common ground, a standard measure. In conventional economics, there is the great leveller of cost; and featureless as the resulting cost surface may be, it is one that all can play on.

Nevertheless, it seems to this reviewer that one need not despair of finding such a standard within the labour process. Even in this book two possible standards suggest themselves: one is the amount of skill required to design, construct or operate a machine. Skill could be measured in terms of the time taken to acquire it. The economist could then compare the skills needed to, say, operate a typewriter or operate a word processor; or again, say, repair a hand-controlled machine tool or repair a computer-controlled one, or still again, say, all the skills in running an old plant or all the skills in running a new plant. With quantitative results the economist could then test the hypotheses that the consequence of technical change is to de-skill work, rather than accepting or rejecting it as an unassailed assertion.

The second standard that suggests itself to the reviewer is the extent of control over individual workers, or over a workforce. Measurement would be more difficult, but not perhaps impossible. Quantitative data would enable economists to test the hypothesis that another consequence of technical change is to extend management's control over labour. The generation of comparable data and the testing of interesting hypotheses would take us far along the path towards an understanding of the labour process, much farther than does a taxonomy.

REFERENCES

1. E. Mandell, *Long Waves of Capitalist Development*, Cambridge University Press, Cambridge, 1980.
2. H. Braverman, *Labour and Monopoly Capital: The Degradation of Work in the Twentieth Century*, Monthly Review Press, New York, 1974.
3. M. Aglietta, *A Theory of Capitalist Regulation: the U.S. Experience*, New Left Books, London, 1979.

J.L. Enos

Magdalen College, Oxford.

Technological Innovation: Strategies for a New Partnership, edited by Denis O. Gray, Trudy Solomon and William Hetzner.

(North Holland, Amsterdam, 1986) pp.ix + 333, ISBN 0 444 70033 1.

This book offers a snapshot of American thinking on technological innovation in the mid 1980s: truly the mid 1980s because, although it is based on a conference held in May 1984, a good deal of the material is later than that.

It is worth serious study in Australia because, although the background and the causes are different, the effects — and the imperatives for action — are much the same. There is a sense of 'innovate or perish': perish, at least, as a country which offers high living standards to its people. In Australia, there is a painful awareness of the sharp worsening of the terms of trade. Other countries no longer want our traditional exports as much as they did, and short of major droughts in the northern hemisphere, that is not going to get better for us. In America, there is a chastened sense of the loss of technological leadership which runs insistently through these pages. There is a new wisdom of the east, as inscrutable and tantalising as the old: how does Japanese industry do it?

The urgency for action leaves little room for abstract theorising. None of the authors wastes much time contemplating the fundamental nature of technological innovation. There is an occasional, simplistic, half apologetic reference to the 'innovation chain', but the diagrams which all too rarely relieve the close print are not models of the innovation process: rather, they are models of organisations and institutional interactions. Collaborations, flows across boundaries, are the order of the day. Interfaces are the barriers to be overcome.

It is a mere retreat into agnosticism for George A. Keyworth, formerly President Reagan's Science Advisor, to emphasise basic research and the quality of science and engineering education. These things are the staple foods of technological innovation, not the revitalising injection which is being called for. Trudy Solomon and Louis G. Tornatzky, in their perceptive rethinking of the Federal Government's role, are more courageous. They argue that technological innovation is not primarily an investment problem but a problem of managing organisations and processes that transform knowledge. Government intervention can be effective to the extent that it can find high leverage niches to influence these processes.