

amount of time which would be required. However as a reference book on Anglo-Italian economics K & S has no competitor. If contemporary economists wished to come to a view on Sraffa, this volume contains everything that would need to be presented to the jury.

CHRISTOPHER BLISS

Nuffield College, Oxford

Economic Choice Theory: An Experimental Analysis of Animal Behaviour. By KAGEL (JOHN H.), BATTALIO (RAYMOND C.) and GREEN (LEONARD). (Cambridge and New York: Cambridge University Press, 1995. Pp. xii + 230. £35.00 hardback, US \$49.95 hardback. ISBN 0 521 45488 3.)

John Kagel, Raymond Battalio, and Leonard Green are well known for their pioneering research programme, in which experiments with rat and pigeon subjects are used to test economic theory. In this book, they summarise the results of their experiments, and of related work by other economists, psychologists, and biologists. Their research programme, they say, has three main objectives. First, and most important, it seeks to test the predictions of the economic theory of rational choice in controlled settings. Secondly, it tests economic theory against alternative theories of choice – particularly, theories based on ‘matching’ heuristics – that have been favoured by psychologists and biologists. Thirdly, it aims to shed light on some important social issues, such as the ‘cycle of poverty’ hypothesis and the debate about the disincentive effects of income taxation.

In relation to the first two objectives, the authors’ research programme has proved highly successful. The familiar theories of consumer choice and of labour supply, based on the assumption of consistent preferences and on the analysis of income and substitution effects, work remarkably well for rats and pigeons. By appropriate choices of experimental parameters, the authors have been able to induce responses which are difficult to explain in terms of matching heuristics, but which have familiar economic explanations. For example, they have induced Giffen goods, goods which are gross complements, and labour supply curves which slope upwards at low wages and then bend back.

In contrast, animal subjects consistently violate both expected utility theory and principles of dynamic consistency. Interestingly, the patterns of those violations are similar to ones that have been observed among humans, and which recent work in economic theory has sought to explain. For example, rats reveal a common ratio effect (a version of the Allais paradox), and are risk-averse for losses but risk-loving for gains; pigeons behave as if their preference for consumption in period t relative to consumption in period $t + 1$ is stronger, the closer t is to the present.

However, the authors’ rational-choice account of animal behaviour confronts

some problems. In their consumer choice experiments, the authors test propositions about preferences over *daily* consumption. Interpreting results from a labour supply experiment with a non-linear wage function, they suggest that rats act as if optimising their labour supply over a two day period. But other experiments suggest that rats and pigeons have extraordinarily strong time preferences (discount rates of the order of 10% *per second*), which would seem to rule out any long-term planning. The authors recognise this difficulty, but their attempts to deal with it are no more than sketched-in afterthoughts.

The authors interpret their findings as reassurance that economic theory is broadly on the right track. The thought seems to be: if the theory works for rats and pigeons, we can have some confidence that it will work for humans too. I find this line of argument appealing, but I would have liked to have seen it developed more fully. The authors offer little explanation of, or even speculation about, *why* the theory of rational choice works so well for rats and pigeons.

They suggest, plausibly enough, that their animal subjects are following hard-wired behavioural heuristics: evolution has equipped them to behave *as if* optimising in situations like those they faced in the experiments. However, the authors do not pursue either of the two lines of enquiry which seem to be pointed out by this suggestion. One line is to try to identify the heuristics which generate as-if optimising behaviour. This is the project that matching theory addresses. Even if matching theory is adequate, we seem to need some theory of this general kind. The other line is to investigate the natural ecology of rats and pigeons, to discover what kinds of decision-making problems evolution is likely to have equipped them to tackle. The authors show surprisingly little interest in the natural lives of the species they study. Still, it would be unreasonable to criticise the authors for not doing everything when, almost alone, they have taken on such a huge research programme, and have achieved so much.

Relatively little of the book is devoted to the authors' third professed objective. I found these sections much less convincing than the rest of the book. It is one thing to use animal experiments to test the general theoretical strategy of economics, and quite another to interpret the preferences of rats and pigeons as evidence about the preferences of humans. To take just one example, it is not clear what the authors mean when they claim that the results of their labour supply experiments on animals 'validate... the potential disincentive effects of guaranteed income programs on labor supply' (page 103). Whether or not such policies have disincentive effects depends on specific properties of human preferences over income and leisure; we surely cannot discover those properties by studying rats and pigeons. (Imagine the implications of using this method to infer human discount rates!)

In every respect but one, the authors present a convincing case for the value of animal experiments in economics. However, I must record my sense of unease about their failure to discuss the ethics of their research methods. All they say on this issue in their 230 pages is that their own experiments were

supervised by and approved by the relevant animal care committees, working under national guidelines. I would have liked to have been told what criteria those committees used, and why the authors thought them to be justified.

ROBERT SUGDEN

University of East Anglia

Population Economics. By RAZIN (ASSAF) and SADKA (EFRAIM). (Cambridge, Mass. and London: MIT Press, 1995. Pp. ix + 275. £25.50 hardback. ISBN 0 262 18160 6.)

Population economics has grown rapidly in the last ten years or so and has now become a recognised economic specialism. The number of undergraduate and graduate courses in the subject is still small compared with other economic specialisms, but it will almost certainly increase. As yet there are few if any books available that cover recent work in population economics and could be used as textbooks. This book seeks to rectify the situation by drawing together some of the literature on population economics to give a cohesive, up-to-date account of the subject.

The book consists of seventeen short chapters; the first two contain introductory material describing the modern microeconomic approach to population economics and setting out some background stylised facts; the remaining fifteen, grouped into six parts, constitute the core of the book. Part I deals with the microeconomic analysis of fertility. It stresses two key influences on fertility: the altruism of parents towards their offspring, which creates a trade-off between the number ('quantity') and well-being ('quality') of children, and the old age security motive, which leads to children being seen as capital investments because of their future roles as carers for their elderly parents. Part II addresses the social evaluation of population size. It compares the implications of average and total utilitarianism and examines the use of taxes and subsidies to try to influence fertility so as to attain an optimum population by non-coercive means. Part III considers the possibility of externalities and market failures in endogenous fertility models and looks at the case for policy intervention to remove these externalities. The focus of interest is the externality effect of parental decisions to transfer resources to children, both by direct bequests and by indirect transfers through investments in human capital that expand future consumption opportunities. Part IV is concerned with income distribution and social security. It sets up an endogenous fertility model and then assesses the impact of social security schemes on the distribution of income between generations (within families) and within generations (between families). Part V is a brief theoretical and empirical survey of the relationship between economic growth and population growth. Finally, Part VI broaches the topics of migration and international trade, concentrating in particular on the connections between the mobility of labour and the mobility of goods and capital.

All six parts of the book rely primarily on theory, and the empirical content is confined to a few general observations. Population economics is viewed by

Copyright of Economic Journal is the property of Blackwell Publishing Limited and its content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.