REVIEWS

Productivity and Technical Change. By W. E. G. Salter. (Cambridge University Press, 1960.) Pp. ix + 198, 37/3d.

Unlike much recent theorizing on productivity in the field of macro-economics, this book investigates productivity changes in relation to technical progress at the industry level. In the first half an attempt is made to establish a theoretical frame of reference for analysing long-term productivity movements. In the second half an interpretation is undertaken of data from a sample of British and American industries.

The theory outlines the interaction between technical progress, gross investment and factor substitution. Technical change is formalized in a series of dated production functions containing all possible efficient designs regardless of factor prices. Entrepreneurial decision, decentralized as a rule, translates the blueprints of the production function into " best-practice " technique. In the industry model, the once-over change of long-term analysis is replaced by a succession of disturbances and of adjustments which proceed side by side. On the assumption of competition, new plants will not come into existence unless the difference between their variable costs and those of marginal plants exceeds the gross margin of capital charges and normal profit. But if new best-practice capacity is added, output will expand and prices fall until newly obsolete plants and excess profits are eliminated. The extent of expansion for a given cost reduction is determined by demand conditions, provided the necessary gross investment is forthcoming. Productivity in the industry is a spectrum of plant productivities whose range varies directly with the cost of best-practice investment and inversely with current factor costs.

Dr. Salter enlarges the neo-classical toolbox by some useful dynamic implements ; he sidesteps Mrs. Robinson's capital puzzle ; and by insisting on a commonsense definition of productivity banishes speculation from the field of measurement. However, by retaining the production function in his analysis he implicitly takes a stand in current controversy. The concept is used to separate contributions to growth by technical progress from those due to factor substitution, analogously to the solution of the identification problem in demand theory. Such a separation would be empirically feasible, if technical progress occurred typically in discontinuities ; even so it would involve constructing a locus of bygone production possibilities, not necessarily such as were actually faced by entrepreneurs, but such as are *ex post* consistent (given some more or less arbitrary assumption) with positions actually chosen. If technical progress is continuous at a rate comparable to that of factor substitution, one may be pardoned for being sceptical of the validity of the imputations of the function.

The inter-industry approach in the second part of the book owes nothing to Leontief It measures the variability in the growth rate of

certain strategic variables and tests their association by correlation analysis. In the interpretative chapters the meat of the book is to be found. The conclusions on structural change and on the distribution of gains have important policy implications for the promotion of growth.

Despite the gap between the theoretical and the empirical part, the book is an important contribution to an important subject and will repay study. If and when a second edition is prepared, proof readers might eliminate certain idiosyncratic spellings of proper names, as well as a reference to such an unusual collector's item as the 9th edition of Marshall's *Principles*.

M. WEISSER — *Bureau of Agricultural Economics, Canberra.*

Regression Analysis. BY E. J. WILLIAMS. (New York : John Wiley & Sons, 1959.) Pp. vii + 214, 83/3d.

For the growing number of non-professional statisticians who nevertheless use regression as an everyday tool of analysis, Dr. Williams' book will provide a clearly-written guide to refinements in methods. The level of presentation assumes a background such as Snedecor's *Statistical Methods*. Thereafter, some better-known principles are explored further and additional theoretical concepts are introduced without being unduly laboured. Sufficient experimental material is presented to crystallise the general approach.

Of 11 chapters, the first three provide a concise reappraisal of regression topics including regressions with grouped data, transformations and orthogonals. Chapter 4 outlines appropriate methods for use with non-linear data. Exponentials and hyperbola are dealt with. As well, useful explanatory comments on earlier, now standard, approaches (e.g., Hartley, Stevens) are included. Chapter 5 details tests to be used in choice of the number of independent variables to be used in a function. This topic could well have followed the discussion on addition or omission of independent variables in Chapter 3. Chapter 6 on the use of regression equations for estimation purposes should be for many readers a salutary one, as numbers of experimenters are inclined to make ill-qualified statements on the basis of insufficient experimental material. Dr. Williams stresses the necessity for greater attention being paid to confidence limits in interpretation of data. Inverse estimation is discussed for situations where direct estimates are likely to be unreliable. Tolerance limits are neatly treated. The derivation of maxima for a one independent variable equation is outlined. A discussion of the n-variable non-orthogonal case would have been a welcome addition. In Chapter 7, some basic ideas underlying covariance analysis are expanded and illustrated. The remaining chapters (8 through 11) deal with what might be termed special

problems in regression analysis and are extremely well-presented. Chapter 8 discusses comparisons among non-homogeneous data quite fully, while Chapter 9 includes a very acceptable theoretical treatment of simultaneous equations. The book is rounded out by an introduction to discriminant functions (Chapter 10), and the final Chapter compares and distinguishes between functional and regression relationships.

The number of examples provided are adequate (about 3 for each chapter.) However, more thought might have been given to selection of material of wider appeal rather than being satisfied with a heavy bias towards forestry science. Extensive computational procedures are omitted for space reasons, a justifiable compromise in this instance.

Dr. Williams is to be commended for writing a straightforward and uncluttered book. It is likely to be very well suited for many research workers in biological and other fields, who wish a closer acquaintance with what might be called an intermediate and not overly rigorous level of regression theory supplemented by sensible examples.

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Agricultural Marketing Policies. BY G. R. ALLEN. (Oxford : Basil Blackwell, 1959.) Pp. xii + 337, 42/- stg.

The purpose of this book is to examine some aspects of British agricultural marketing, using as a basis an analysis of the economic criteria by which marketing methods can be evaluated. In a book which has " like Topsy, just grown " a systematic and synthetic coverage of problems of marketing cannot be expected. Much of the book consists of articles, previously published in the *Farm Economist* or the *Bulletin of the Oxford University Institute of Statistics*, which have been enlarged and expanded.

The book falls into two main parts. Firstly the examination of the theoretical basis for evaluation of the efficiency of marketing methods places a good deal of emphasis on commodity cycles. One criterion for evaluation is the extent to which fluctuations and uncertainty in agricultural output and prices are minimised. Perhaps Mr. Allen puts too much emphasis on this criterion and not sufficient on his other criteria of the need to establish monopoly marketing organisations to oppose monopoly buying firms (Galbraithian countervailing power), and simple minimisation of the costs of marketing.

Secondly, various proposed and existing marketing systems in the U.K. are critically examined. The most detailed analysis concerns the fruit and vegetable marketing industry. Meat and milk marketing receive less detailed treatment and a number of other industries are examined briefly.

One of the most valuable aspects of the book is that the arguments and conclusions are supported by a wide range of statistical material.

The conclusions reached should be interpreted in the light of the author's strong leanings towards economic liberalism. In general he concludes that " policies intended to secure immediate or long term reductions in marketing costs should be aimed at increasing competition rather than eliminating it ".

However, in examining detailed industries he finds a number of instances where uncontrolled competition has led to obvious inefficiency. Fruit and vegetable wholesaling is too concentrated in Covent Garden and other large city markets ; a producers' marketing firm in competition with other firms could reduce the imperfections caused by social homogeniety (e.g., family ties) in fruit and vegetable, meat, and milk marketing, and could remove the " live and let live " attitude in these industries ; and overlapping rounds are very wasteful in milk retailing. As distinct from the mild intervention which these conclusions suggest, the creation of statutory marketing authorities can only be justified where it is the most efficient method of preventing production cycles, or where it is needed to provide countervailing power.

One of the apparent reasons (though never openly admitted) why farmers press for the establishment of marketing boards in the U.K. is to aid them to obtain higher prices for their products, and hence higher incomes at the expense of the remainder of the community. Mr. Allen claims that he has omitted consideration of this aspect of the Boards' activities. However, he criticises the activities of the Milk Marketing Board on just this score. He has generalised his criticisms of these activities elsewhere.[1]

When this book is being assessed it is important to regard it as a book on agricultural marketing policies and not more generally on agricultural marketing. Mr. Allen differentiates between the value of the Boards as they have in fact functioned, and their potential value if they functioned in an ideal fashion. However, it does appear that he has taken inefficiency in practice as evidence of the disadvantages of planning and control in general, and given them undue weight relative to the imperfections which he himself finds in unfettered competition.

The main sources of interest to Australian readers will be the methods and results of such estimates as the efficiency of types of marketing organisations and the optimal scale of marketing firms, and the detailed information which is provided of the methods by which some local farm products are sold on the U.K. market. As a matter of interest, the Wool Marketing Board is one of the few Boards which meet with approval.

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1. Allen, G. R., " A Royal Commission for the Boards ? " *Westminster Bank Rev.* Feb., 1960, pp. 14-6.

Statistical Cost Analysis. By J. Johnston. (New York : McGraw-Hill Book Company, 1960.) Pp. ix + 197, $6.75.

The statistical analysis of costs has never seriously got under way. Economists have turned to the more promising fields of production function analysis, while accountants have failed to enter the realms of functional relationships and hypothesis testing. (An interesting exception is provided by Phillip Lyle's *Regression Analysis of Production Costs.*) The economist has rightly centred his interest in the production function, since if factor prices are known the cost function can be easily derived. But the economist has an interest in costs, *per se.* For instance, intelligently based agrarian reform and land settlement policies necessitate some knowledge of the long-run cost curve.

Professor Johnston's handbook on statistical cost analysis provides an excellent reference for those who wish to enquire into the nature of business costs. His analysis, however, is directed neither to cost prediction nor parameter estimation, but rather to the testing of hypotheses about the *nature* of the cost curve. The assumptions of perfect competition and the variable proportions relationship have usually led to the hypothesis of U-shaped short-run marginal and average cost curves. But other types have been postulated, such as the rectangular hyperbola average cost curve (constant marginal cost) or the linear segment cost curves of linear programming (Ch. 2).

The main section of the book (Ch. 4) consists of a discussion of empirical studies for six industries. Prior to this section Johnston deals with the problems of statistical procedure (Ch. 3), touching on problems of data inadequacy, the assumptions of normality, homoskedasticity, and serial independence of disturbances, and the independence of explanatory variables and disturbances. It is the last of these problems which raises most doubts about least squares for cost analysis. Cost as a function of output reverses the direction of causality (except where we can assume production control) so that production decisions are unlikely to be separable from the disturbance term of the cost function. There have thus been sound statistical reasons for the econometrician's preference for production function analysis. Johnston raises this problem, but leaves it hanging in the air with little reference to it in the discussion of empirical results.

The empirical material is imaginatively analysed and ably presented. Unfortunately none of the six industries considered includes agricultural production, despite Johnston's suggestion that the most ideal data exist for agriculture. The empirical results are best summarised in the words of the author (p. 17) : " . . . (a) in the majority of cases where statistical tests have been applied, the hypothesis of a linear total cost function has not been rejected, (b) most often no statistically significant improvement on the linear hypothesis is achieved by the inclusion of second—or higher—degree terms in output, and (c) supplementary tests, such as the examination of incremental costs ratios, usually confirm the linear hypothesis."

The most interesting sections for agriculturalists are those discussing the multiproduct firm (pp. 87 ff) and labour productivity (pp. 110 ff). The former raises many interesting implications for budgetary and linear

programming procedures, and the latter type of information can give much guidance to the policy maker. The concluding chapters (5 and 6) present a valuable review of other published empirical cost analyses and a critique of the criticisms of statistical cost studies.

Statistical Cost Analysis is well and concisely written, though its index is a little too parsimonious. It is not a textbook, but rather a not unduly technical reference. It is hoped that a book such as this will suggest many useful avenues and techniques for Australian agricultural economists, and lift cost of production studies out of their present naive level of both analysis and usefulness.

R. G. MAULDON

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Economics of Road Transport of Beef Cattle : Northern Territory and Queensland Channel Country. (BUREAU OF AGRICULTURAL ECONOMICS. Canberra, 1959.) Pp. 83.

Throughout the history of the beef cattle industry in the northern section of Australia, the long distance movement of cattle to markets has been one of the main problems hindering development. This report, together with the previous one covering the road transport of cattle in Western Australia, is extremely timely and valuable in view of the growing interest in road planning for the beef industry by both governmental and private organisations.

Although the report covers a wide range of topics relating to the cost of operating various powered road units for transportation of cattle, the main interest lies in the questions directed at cattlemen. The report maintains that the road transport of fat cattle is more profitable than droving ; but that for the movement of stores, droving still pays. Perhaps the most important topic raised is the possible development of road transportation of young stock, weaners and yearlings. The report briefly mentions some of the possible economic changes in station management associated with marketing this type of beast. However, with the present state of roads in this part of the Continent, the full development of road transport of cattle is not possible. For instance, one of the main objections raised by cattlemen, excessive bruising, is the fault of the roads, not the hauliers.

In many ways, the report is a glimpse into the future and will serve as an excellent reference guide to those interested in the northern beef industry. However, the generally poor presentation of the report is annoying. Some of the tables are numbered, others not, and in several instances, the appropriate sentence describing a table appears on one page, the table on the next. Furthermore, the distances shown where road transport becomes uneconomic could be rounded off and not left within single miles, e g., 311 miles. The general quality of the maps in the

report is poor and although latitudes are mentioned frequently, none of the maps show the appropriate parallels. On the credit side, it is pleasing to see an attractive cover on a report from a government department.

G. R. SPINKS — *Northern Territory Administration, Darwin.*

Modern Mathematical Methods and Models (2 *Vol.*). BY DARTMOUTH COLLEGE WRITING GROUP. (Mathematical Association of America University of Buffalo, Buffalo 14, N.Y. 1957, 1959.) $2 per vol.

Introduction to Finite Mathematics. BY J. G. KEMENY, J. L. SNELL AND G. L. THOMPSON. (Englewood Cliffs : Prentice-Hall Inc., 1957.) Pp. xi + 372, 64/9d.

Modern Mathematical Methods and Models is designed as a sophomore (Second Year) text for biological and social science students who have already done a one year "universal course".[1] The universal course offers a half-year of coordinate geometry and calculus, and a half-year of elementary set and probability theory. Thus *Mathematical Methods* presupposes at least a knowledge of New South Wales Leaving Certificate, Pure Maths. I. In practice it is likely that a lecturer using this text would wish to develop calculus and probability theory from the ground up.

To the reviewer's knowledge, these are the first *mathematical texts* designed specifically to meet the needs of social scientists. In this way they differ from a number of texts on mathematics or statistics "for economists". *Mathematical Methods* and *Finite Mathematics* are essentially mathematical. Consequently, they are written in a fairly brisk style, and provide a reasonably rigorous treatment in terms of definitions and theorems. This in turn means that they teach the student some mathematics, as well as allowing him to express known economic relationships algebraically.

The result is undoubtedly successful, and the question for debate is not whether the Australian agricultural economics curriculum should include a compulsory course based on *Mathematical Methods*, but whether such a course should be spread over one or two years. The mathematical cuckoo is growing up. It will be interesting to see whether there is room for all the present courses in the nest, and if not, which ones have to be eased out.

1. Mathematical Association of America, Committee on the Undergraduate Program, *Universal Mathematics*, Tulane Book Store, Tulane University, New Orleans, 1955.

Briefly, the first volume of *Mathematical Models* deals with matrix algebra, calculus, integration, difference and differential equations, multivariable functions, and optimization problems ; the latter with particular attention to linear and non-linear programming. The second volume deals with probability theory, order relations, Markov chains, and models for the social sciences. *Introduction to Finite Mathematics* relates logic to mathematics, and then deals with elementary set theory, probability, matrices, and some applications to the social sciences, with special emphasis on game theory and linear programming. *Mathematical Methods*' treatment of difference and differential equations is particularly good but rests heavily (as does the whole treatment of calculus and integration) on a handbook.[2]

Three minor but general criticisms of *Mathematical Methods* would be that it is a bit too crisp, the exact relevance of the mathematics to the social sciences is not always entirely clear, and there is too little cross reference to other reputable mathematics, and mathematical social science texts. Fortunately, all of these deficiencies are remedied (at least for the relevant chapters) in *Finite Mathematics*. The latter text can, of course, be criticised for being slightly too long winded and occasionally lacking in rigour ! In general, the two texts are likely to be complementary, in the full production economics sense of the term.

One major but detailed criticism of *Mathematical Methods* is that its use of the term " dynamic programming " would not be acceptable to Bellman. Their so called, " dynamic programming " is merely linear programming with reference to a number of time periods. They do not mention Bellman's principle of optimality, nor do they indicate his powerful technique for transforming one problem in n-variables to n problems in 1 variable.

WILFRED CANDLER *University of New England, Armidale.*

The Australian Grazing Industry : A Review of Factors Influencing Production in the Sheep and Wool Industry. BY G. D'A. CHISLETT. (Sydney : The Land Newspaper Ltd., 1960.) Pp. 72.

In this pampero Mr. Chislett argues that, since wool is an export industry with a very limited home market, the woolgrower is a defenceless victim of Australian inflation. The main theme of the argument is that for the foreseeable future, wool export earnings will continue to be critical in Australia's balance of payments and that under existing price relationships there is insufficient residual income available for investment. It is suggested that since future production is a function of current investment,

2. Cogan, E. J. and Norman, R. Z., *A Handbook for Calculus, Difference and Differential Equations.* Prentice-Hall, Englewood Cliffs, N.Y. 1957. 52/6 Aust.

the role of wool as our major export earner will be in jeopardy unless the economic climate is made more congenial for the woolgrower.

A necessary condition for investment is optimism in the future of the commodity. Such optimism is most effectively provided by rising farm incomes and adequate profit margins. Realistically, Mr. Chislett assumes that wool prices show little prospect of any marked improvement, so that possible solutions must be found on the costs side. The very low rates of return to capital and the low net incomes as revealed by B.A.E. surveys are noted. However, no mention is made of land values which have remained at a high level, or that net income is low partly because items of capital expenditure may be treated as cash costs for taxation purposes. Ironically enough, such taxation concessions have made rural investment attractive to highly taxed non-farm groups seeking to obtain tax-free capital appreciation. It is interesting to note that among the solutions and palliatives suggested, there is apparently little scope for further tax concessions.

Mr. Chislett then examines wages and prices and deplores the restrictive practices that appear to exist, but considers that the plight of the wool industry cannot be improved to any extent in this sphere. Credit has limited application because the uncertain future of wool has induced a " wait and see " policy amongst graziers. The high wool prices of the earlier post-war years and the elimination of farm indebtedness has assisted this policy. Thus, whilst Mr. Chislett does not misrepresent the facts, he arranges them to suggest a more sombre picture than actually is the case.

Any change from the present auction system to some form of controlled marketing also fails to offer any lasting solution. Mr. Chislett considers that " at the most it might achieve a once and for all increase of a few pence in the level of prices above the free auction level, but the gain to the Australian woolgrower would be short lived ". This rather surprising statement must mean that any wool price increase will be of only temporary assistance—because any such gain will be quickly eroded by inflation. For this reason devaluation is not considered a suitable tool.

Having concluded that any form of general assistance to export industries would be quickly absorbed in higher costs, Mr. Chislett is forced to look for a more specific remedy. The possibility of the need for some form of subsidy is then given serious consideration ; the attraction of a subsidy being that it can be selective and consequently its benefit more lasting. However, Mr. Chislett meticulously avoids any reference as to what form the subsidy will take, its possible duration, or the amount of transfer payments likely to be involved.

Mr. Chislett concludes with a pot pourri of additional measures in which increased financial aid by government would assist the industry. It is in this brief section which covers such matters as transport, labour, education, extension services, production instability and land policy that the most practical solution probably exists. Thus, Mr. Chislett's *Review* does cover a great many of the factors influencing production in the sheep and wool industry, and in doing so highlights the fact that much of Australia's enforced growth has occurred at the expense of the wool grower. A valid case has been presented but the *Review* lacks any real solution.

A. WARD *Canberra.*

Proceedings of the Tenth International Conference of Agricultural Economists : Agriculture and its Terms of Trade. (London : Oxford University Press, 1960.) Pp. xii + 535, 68/–.

The Proceedings of this Conference held in Mysore, India, in 1958 include 23 papers dealing with the problems of balance between agriculture and other activities in the process of economic growth. With few exceptions the problems discussed are those of advanced Western economies. This is somewhat surprising since this was the first occasion on which the Conference had been held in Asia. Moreover, it is obvious from the reported discussions that delegates—both representatives of under-developed countries and others observing, perhaps for the first time, the abject poverty of the host country—were acutely aware of the problems of Asian peasant agriculture. There can be little doubt that Mysore would have proved an ideal venue from which to tackle some of the problems of agriculture in under-developed economies. This apparent discrepancy between Conference theme and place appears to have been rectified for the next Conference to be held in Mexico in 1961.

These *Proceedings* do provide, however, an excellent survey of contemporary thought concerning the factors determining changes in agriculture's terms of trade and the scope for national and international action to deal with actual and impending shifts in the fortunes of agriculture. Following a discussion of the nature of the supply and demand for farm products and resources there is a consideration of institutional flexibility under peasant, developed capitalist, and Soviet collective types of agricultural organization (Bićanić). There is general agreement between authors in this section and ample support for the contention made in the opening paper (Lewis) that " the terms of trade must move against the farmer unless the proportion of the population engaged in agriculture contracts. So far as the agricultural economist is concerned, the main remedy for the farmer's ills must always be to have fewer farmers ". But this " farm problem " has long been recognized and is well documented elsewhere. What is surprising, therefore, is the continuing absence of empirical evidence. Specifically, what is the real-income differential between comparable farm and non-farm labour ? What has been the relationship between this differential and the rate of migration from farm areas ? What has been the effect of alternative public policies on this differential and on the resulting movement of population ? What is the aggregative effect of individual farm adjustments to changes in prices and costs ? A number of papers pose these and similar questions but make no attempt to answer them. Consequently, with one exception, the early papers read as a review of the not so current literature. The exception is an analysis of the demand for farm products (M. Cepede). Here the author foresakes traditional demand theory in estimating the quantity of initial (i.e., vegetable) calories needed to attain given levels of living.

One paper which should interest all agricultural economists is " Education, Research and Extension " by Dr. A. T. Mosher. The author reminds us of the ever present danger of imparting knowledge of agricultural economics merely in order that it may be taught by someone else, and of upholding techniques of economic analysis without concern

for their usefulness in application. Referring to the needs of Asia and Latin America he calls for an intimate functional relationship between education, research and extension so that each is influenced by, and served by, the other two. The same plea might be made in terms of farm management in Australia. Despite the widespread interest in problems of farm management and organization there is no centre anywhere in Australia capable of unifying the educational, research and servicing needs of this developing science.

A paper by Dr. T. H. Strong, " Using Economic Research in Policy Making ", raises the evergreen question of the role of an agricultural economics bureau in policy-making. The author adopts the approach that any such authority " may not be able to delineate the ' best ' policy but it should not be reluctant to try ". Who, more than the agricultural economist diagnosing agricultural economic problems, is in a position to delineate the implications of alternative courses of action ? One wonders whether a great deal more agricultural economics research in Australia should be policy orientated.

Following a diverse collection of papers which range from agricultural marketing to the interdependent development of agriculture and other industries, there are three papers devoted to international organization. Of these, Australian readers will probably find greatest interest in the discussion on inter-regional groups. The author, Professor A. G. Baptist, outlines European efforts towards economic integration and examines some of the difficulties encountered or likely to be encountered in bringing agricultural sectors into programmes of the European Economic Community and the Free Trade Area.

Perhaps the most disappointing section of the entire *Proceedings* is that dealing with planning procedures. An International Conference of this nature, particularly the first to be held in Asia, would seem to provide a unique occasion for critical appraisal and international comparisons of planning procedures. The reader is presented, however, with four interesting but purely descriptive papers dealing in turn with schemes of economic development undertaken in India, Japan, Israel and the U.S.S.R.

On the analytical side, then, the book is somewhat disappointing. It could hardly be otherwise in view of the broad sweep of subject matter. On the other hand, the real test of the contributed papers at an international conference is that they advance propositions capable of further formal and informal discussion. By such a criterion many of the papers in this Proceedings are eminently satisfactory.

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