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BOOK REVIEWS AND NOTES

The Theory of Capital, Proceedings of a conference held by the International Economic Association, F. A. Lutz (Chairman of Programme Committee) and D. C. Hague (Editor). London: Macmillan, 1961. Pp. xiii, 415. 50s. (Stg.).

The title of this volume does not give a very good indication of its contents. This is not a textbook on the subject and also, rather than presenting a unified approach, it serves to highlight the various approaches to the many facets of capital theory. This is only to be expected from a Round Table Conference of the International Economic Association attended by a select group of eminent economists from predominantly academic circles. Contributors of papers at the Conference include: F. Lutz, J. R. Hicks, P. A. Samuelson, W. Fellner, T. Barna, E. D. Domar, W. G. Hoffman, A. Barrere, B. Thalberg, N. Kaldor, D. G. Champernowne, R. M. Solow, J. Marchal and D. C. Hague.

The papers of this Conference are in the main at a fairly high level of abstraction and sophistication and provide a comprehensive statement of current academic thinking on capital theory. However, there are a few papers which provide, for the uninitiated, useful surveys of some facets of capital theory, for example the introductory paper on "The essentials of capital theory", by Friedrich Lutz.

Lutz, as Chairman of the Programme Committee, also contributes a very useful Introduction which is mainly a resume of the papers and conference discussion which he groups for purposes of his summary under the following headings:

1. The problem of measuring capital.
2. The capital-output ratio, its meaning and its actual behaviour.
3. The classification of technical innovations according to their labour-saving or capital-saving character.
4. The influence of the interest rate on investment.
5. Capital in dynamic growth models.

On the problem of measuring capital the academics set the statisticians (a few of whom were also present at the Conference) quite a serious practical problem by formulating complicated models, the variables for which it was difficult, or nigh-on impossible, to obtain empirical data.

Failure to reach agreement on the question of the stability of the capital-output ratio was instanced by Lutz as an example of the very real difficulty of obtaining unanimity in certain aspects of capital theory, even when supporting empirical data were available. In this particlular case the argument centred around whether certain empirically recorded changes in this ratio were sufficiently insignificant to validate the assumption of stable capital-output ratios in some of the best known models of dynamic growth.

Only one aspect of Interest Theory received special attention at the Conference, that is the influence of the rate of interest on investment. Thalberg's paper was especially devoted to this topic and it was also dealt with by Barrere in his paper "Capital intensity and the combination of factors of production".

Barrere's paper, also on a fairly theoretical level, is probably the most pertinent one for the production economist. Of particular interest is his treatment of the entrepreneur's profit motive. This topic also came up in Lutz' paper and in the discussion following his paper. It was generally agreed that different firms or the same firm at different times may, for good reasons, follow different criteria of profit maximization. At the same time it was agreed that if it was necessary to generalize, Fisher's criterion of maximizing the present value of future profits was preferable to Wicksell's criterion of maximizing the internal rate of return.

Of the section dealing with dynamic theory Lutz in the Introduction significantly suggests the need for more empirical research to be carried out in order to 'test' the validity of the advanced theoretical hypotheses propounded.

Lutz also reports that marginal productivity theory, particularly as it applies to the determination of income from capital, was strongly attacked. Marchal in his paper, without rejecting marginal productivity theory outright, favours a theory which explains distributive shares as a result of the power of the groups participating in the economic process, although he does not fully develop this theory.

While this book is to be welcomed as a valuable contribution to the relatively sparse literature on capital theory, one cannot but regret the gap which remains between the theorist on the one hand and the empirical researcher and the project economist on the other. It would be useful if some measure of understanding of common problems could be achieved by a Round Table Conference with greater emphasis on the relationship between theory and practice.

It is worth noting that the book contains a useful 11 pages of index and that the discussion, apparently reported in full, occupies 115 pages.

Department of Agriculture, Sydney GEORGE MASON

Agricultural Productivity in the United States, Charles O. Meiburg and Karl Brandt. Stanford: Stanford University. Reprinted from *Food Research Institute Studies,* Vol. III, No. 2, May 1962. Pp. 22. $1.

Nonfarm Inputs as a Source of Agricultural Productivity, Charles O. Meiburg. Stanford: Stanford University. Reprinted from *Food Research Institute Studies,* Vol. III, No. 3, November 1962. Pp. 5. $1.

Apart from their main purpose these papers touch on some important theoretical questions in the measurement of changes in agricultural productivity. These points emerge as the authors review eight indexes of agricultural production in the United States covering various phases of the period 1866-1960. Meiburg and Brandt then proceed to make their main (and original) contribution: to explore the *causes* of changes in agricultural productivity, especially the causes of sharply-rising productivity since the 1930s.

A major point, raised in the first publication and further developed in the second, is the widespread tendency to underestimate the part played by non-farm inputs (fuel, fertilizer, feed concentrates, seed) in raising the level

of agricultural productivity. To illustrate the perils of this practice, Meiburg mentions the technical change (early in the present century) which enabled the chemical industry to produce nitrogen more cheaply. He then sets out the logic which reveals this development as an example of an increase in net farm productivity resulting not from technical change in the farm sector but from technical change in the non-farm sector. He further argues that the claim that non-farm inputs influence agricultural productivity does not rely entirely on the substitution of non-farm for net farm inputs (farm labour, land, tractors, etc.). New products, which farmers have never produced themselves (e.g., pesticides) may also be expected to raise net farm productivity.

Thus Meiburg and Brandt have shown that the problem of defining the real causes of changes in productivity in agriculture grows in complexity as farm production becomes more dependent upon non-farm inputs. Their analysis demonstrates that the influence, or potential influence, of non-farm inputs (or the capital and labour devoted to producing them) on agricultural productivity can no longer be neglected.

G. C. McFarlane

Department of Agriculture, Sydney

Production Function Analyses of British and Irish Farm Accounts, Knud Rasmussen with M. M. Sandilands. Loughborough: University of Nottingham, School of Agriculture, 1962. Pp. viii, 116. 17s. 6d. (Stg.).

In the introduction the authors convincingly define their study in relation to the four principal problems encountered in the calculation of production functions—choice of function; choice of variable and difficulties arising from the high degree of inter-correlation between them; difficulties arising from possible errors of measurement of the input variables; and finally the problem of interfarm and intrafarm relationships. With regard to choice of function the authors point to the "goodness of fit" achieved with the Cobb-Douglas function used and the near-normal distribution of the residuals about the regression surfaces. In the authors' experience the Cobb-Douglas function "passes the acid test" of agreement with reality and "is able to describe relevant economic relationships within the range of combinations of inputs found in the data".

As far as the choice of variables is concerned the general principle has been followed of including all inputs which can be considered to determine the costs of achieving the given output and at the same time to group them in such a way that they represent the main cost items to which British farmers are accustomed. This led in the first instance to the four independent variables—rent and rates; total tenant's capital; total cost of labour including farmer and wife; and total purchases of raw materials, etc. Extension to seven independent variables involved further breakdown of these inputs. The dependent variable is Gross Product.

The degree of inter-correlation among the independent variables was alarmingly high (range .39 to .93 in the variables included together) and one is left a little in awe of the authors' conclusion that because the between farms regressions show individual regression coefficients which

are *all* significantly different from zero at the 1 per cent level, the independent variables are not too highly correlated for the use of multiple regression techniques. One cannot help feeling that insufficient attention has been given to the possibility of obtaining spurious estimates of the regression coefficients by including such highly inter-correlated variables in the regression analysis.

With regard to the errors of measurement, as a separate problem, the authors explain that such errors result in a systematic downward bias in the size of the regression coefficients and that steps have been taken to minimize this by means of regression using variance and co-variance components.

The author's argument for accepting the interfarm function as an estimate of the intrafarm function is based largely on the findings that farmers of similar managerial ability in fact differ very much in their input combinations and that "the various combinations actually found may in the event be considered to be approximations to experimental data. Thus the production functions can be expected to provide good estimates of the Gross Product *resulting* from the various combinations" (p. 26). Also, in support of this claim the authors consider (p. 42) that there is no strong correlation between the farmers' "managerial" ability and their choice of combination of resources. Because of difficulties of experimentally testing this hypothesis the question must surely remain a philosophical one. A necessary condition for the hypothesis must be the similiarity between farms of the underlying technical production functions. The reviewer looked unsuccessfully for any evidence in support of the similarity of the physical environmental conditions which limit the production relationships of the farms compared.

Despite the questioning of some of the basic assumptions in the study, the utilization of Farm Management Survey data for further rigorous economic analysis must be highly commended. It was as long ago as 1955 that A. G. Antill [1] and J. O. Jones [2] published what were apparently the first production function estimates based on Farm Management Survey data.

As the authors mention at least twice (p. 1 and p. 37) that to their knowledge all earlier studies used only one year's data for estimating farm production functions, the reviewer would like to come to the defence of Yair Mundlak [3] whose study called "Empirical Production Function Free of Management Bias" broke similar ground to that claimed by Rasmussen and Sandilands.

This brings us to the most significant feature of the study—the apportionment (based on 4 years' accounts) of the variance in Gross Production unexplained by the regression into a "managerial" and a "random" variance. The authors attribute the "managerial" variance very largely to the choice of inputs within any given "global" combination of resources

[1] "Towards a Production Function for Dairy Farms", *The Farm Economist*, Vol. VIII No. 1 (1955), pp. 1-11.

[2] "The Productivity of Major Factors in British Farming, I", *The Farm Economist*, Vol. VIII No. 4 (1955), pp. 1-20.

[3] *Journal of Farm Economics*, Vol. 43, No. 1 (February, 1961), pp. 44-56.

and the efficiency with which these are used. The random variance is due to variations in the environmental conditions outside the control of the farmer such as climate and biological variations. Managerial and random variance were shown to be approximately the same magnitude and together to have a considerable effect on income.

Two important messages emerge from this study. Firstly the dangers inherent in basing farm economic analyses on a single year's records and secondly, the "relatively small importance of combination of resources (at least in this case) in relation to 'managerial' variation" (p. 42).

This publication must be regarded as a very useful contribution to methodology in the estimation of production functions.

GEORGE MASON

Department of Agriculture, Sydney

Grain Yields and the American Food Supply, D. Gale Johnson and Robert L. Gustafson. Chicago: University of Chicago Press, 1962. Pp. xii, 146. $3.50.

This monograph which is sub-titled "An Analysis of Yield Changes and Possibilities" is an attempt to analyse the potential of the United States of America to produce cereal grains, particularly wheat and maize (corn) which in recent years have accounted for about three-quarters of the nation's total cereal grain production.

The authors have applied statistical methods to the study of available American data in their forecasting of the grain needs of their country. Their forecasting is aimed at the year 1980 by which time the U.S. population is expected to be about 250 million—a fivefold increase over the 1880 figure. They estimate that to meet the nation's needs by 1980 grain output would have to show a net increase of slightly more than 50 per cent on the average figure for the period 1950 to 1957. They argue that most of this expansion would have to come from increased per acre yields since an increased acreage under grain would not, by itself, be anywhere near sufficient and in any case there would be a limit to the additional area which could economically be sown to grain. On the basis of the expected demand for grains by 1980, they believe that if the area sown to grains was increased by 10 per cent, grain yields would have to increase by 40 per cent as compared with the average for the 1950 to 1957 period.

The study consists of five chapters: the extent and significance of grain yield increases between 1880 and 1958; the effects of weather and geography on grain yields; an analysis of man's influence on grain yields; the future possibilities of grain production and, finally, an epilogue. The first chapter is more in the nature of a summary and was prepared with an editorial contribution by Paul B. Sears of Yale University, who also provided a general introduction to the study and to each of the remaining four chapters.

The authors examine in detail the effects of weather conditions and changes in acreage locations on the national average grain yields; while acknowledging the part played by them in yield variations the general

conclusion reached is that neither can account for the increase in average yields between 1900 and 1950. The answer to a large extent lies in man's efforts and the parts played by those factors that are more directly under the influence of man (such as increased use of fertilizers, mechanization, irrigation, summer fallowing, different seed varieties, etc.) are analysed and their effects estimated.

Various factors that have had an influence on grain yields in the past and are expected to have an effect in the future are then analysed, viz. increased use of fertilizer, improved seeds, expansion of summer fallow, increased irrigation and acreage changes between the different grains. While the authors do not attempt to predict the pattern of grain yield increases in the next two decades they are certain, barring some catastrophe, that significant yield increases will be obtained.

The research upon which the study was based had almost been completed by 1959, having been under way for four years at that time. However, the authors point out that the lapse in time between commencing the project and publication of the results proved worthwhile in some respects. It enabled them to test some of their results and estimates against the yields obtained during the period 1957 to 1960. The epilogue compares the actual 1957-60 yields with those they would have expected themselves and indicates how much of the production task envisaged for 1980, as compared with the period 1950 to 1957, had already been achieved.

In short, this study is a very detailed effort to determine the influence of several variables upon changes in grain yields and to indicate the possibilities of further increases in yields to meet the expected grain needs for the increased population anticipated by 1980. However, to understand fully the methodology employed some knowledge of regression analysis would be desirable and for that reason those inexperienced in this field, although no doubt interested in the conclusions reached, would find various parts of the monograph rather difficult to follow. Nevertheless, all of the discussion is by no means highly technical. The text itself consists of a relatively small number of pages and there are frequent tables and graphs to illustrate the discussions.

B. K. COMPTON

Department of Agriculture, Sydney

Transport Problems in Relation to Economic Development in West Africa, Secretariat of the Economic Commission for Africa. Addis Ababa. Pp. 68, 5s. 0d. (stg.).

Several of the problems relevant to the development of transport services in West Africa are also relevant to conditions existing in Papua and New Guinea and, less directly, to the more sparsely populated regions of the Australian mainland. This bulletin provides a framework within which it is possible to discern how much of the African developments are applicable to our own conditions, and to what extent these developments are irrelevant to us.

The first chapter, "Basic Factors Determining Transport Development," provides a broad outline of the requirements for transport development imposed by the economic structure of the region and its political history,

and reviews the extent to which physical and climatic conditions have restricted this development in the past. Many aspects of the geographic conditions and economic structure have raised problems somewhat similar to those experienced in New Guinea and parts of Australia.

The second chapter commences with a review of the peculiar conditions of demand for transport services—the facilities demanded are quite different in quality and much more heterogeneous than in more developed areas; with freight there is frequently a preponderance of traffic in one direction, since many regions are, in terms of volume at least, heavy net exporters; and a large proportion of the passenger/miles carried is accounted for by itinerant merchants and migratory workers.

The second and major part of Chapter 2 outlines the present status of (and current developments in) various classifications of transport services, primitive transport, railways, ports and harbours, inland waterways, roads, and commercial air transport.

The relatively brief third chapter on "The Cost of Transport," after a simplified outline of the elements in transport costs, the high proportion of fixed costs and, for railways, the tendency towards a "stepped" cost function, goes on to describe the difficulties associated with the development of a pricing system for transport services. These have become more complex as the general structure of transport industries changed from a virtual monopoly on the part of the railways to an increasing degree of monopolistic competition with the developing importance of road transport.

A chapter on "Transport Policies" concentrates on post-war policies and the extent of co-ordination between different types of transport industries. The discussion points strongly to the need for care in the planning of transport programmes in underdeveloped regions; the complexity of factors relevant to planning is illustrated with a discussion of the selection of road or rail as alternative forms of investment in transport The chapter concludes with an outline of problems related to sub-regional transport—transport links between adjoining states—and current policies in relation to their development. The text concludes with a brief discussion of the experiences gained in the application of transport policies.

The bulletin provides 3 pages of statistics on the development of transport facilities in West African countries in the form of an appendix, but, as the body of the text points out, some caution must be used in their interpretation and they are not generally comparable with figures published for more developed economies.

The merit of this bulletin lies in its description of the general background against which transport development in West Africa must be judged. This generality, and the avoidance of any real analytical technique, has the genuine advantage of giving a quick review of the situation, but also sets a definite limit to the relevance of the bulletin to other economies.

S. J. FILAN

Department of Agriculture, Sydney

Economic Bulletin for Africa, Vol. II, No. 2, June 1962. Addis Ababa: Secretariat of the Economic Commission for Africa. Pp. 101. 10s. 6d. (Stg.).

This bulletin presents five studies submitted to a Working Party on Economic and Social Development which met in January, 1962, at the Addis Ababa headquarters of the Economic Commission for Africa. The studies are prefaced by a brief summary of the meeting and a comparative study of the structures of 15 selected African economies, and the economy of Mexico of 1950 when it is suggested that this country was at the "take-off" stage. This background paper discusses the distribution and density of population, the role of commercial production and the pattern of trade and relates these items to such factors as sources of power, transport patterns, the level of education, and capital formation. The possibility for planning for the development of this resource complex is introduced with a discussion of the role of government in these economies and of the instruments of policy available: it is found that the usual structure inhibits the scope for the effective impact of government policy. The article concludes with the question of the extent of structural imbalance.

A paper on "Economic Planning in Africa" precedes an outline of the institutional framework of planning with a short review of the historical role of planning in Africa and of current development plans. Planning institutions are discussed in two categories—autonomous government bodies, and those where planning is incorporated within the ministerial system. Further categorization may be based on the extent and system of co-ordination between those drafting a plan and those responsible for its implementation. A description of the objectives of current plans and the techniques used in their formulation is followed by an extensive review of the pattern and source of financing of these plans, with regard to public, private and external sources.

A third paper, "Notes on a Method of Comprehensive Planning in Tropical Africa", points out the difficulties involved in formulating planning objectives in terms of desired growth rates for the economy generally because of the lack of reliability of estimates of capital/output, income/savings and similar ratios: however, these relations are useful at the project and industry level of planning. The author of this paper presents input-output models as a suitable technique for the analysis of the structure of these countries—he suggests, with some optimism, that industries in this area are sufficiently homogeneous to avoid any major errors associated with the problems of aggregation. Further, it is suggested that this relative homogeneity allows planning to be based on a model with detailed accounts for only the major industries, with the rest of the economy treated at a highly aggregated level. Planning is to be based on the application to the model of a projected level of final demand which is to be synthesized from projections of consumer and export demand, government expenditure and exogenously determined investment. Despite the difficulties involved, it is argued that such projections are feasible.

Difficulties in the application of an input-output model to the underdeveloped countries discussed are associated with the validity of the implicit assumption of constant technical coefficients, and with the probability of leakage of stimuli through imports: these problems are noted,

but little attempt is made to answer them. However, the paper does have value in its suggestions of ways in which a fairly simple model can be applied to a number of planning problems without any necessity for mathematical sophistication. The writer concludes with a short discussion of the role of government policy in providing incentives for the various sectors of the economy to carry out the projects envisaged by planners.

A paper on "Demographic Factors Related to Social and Economic Development in Africa" provides voluminous background information on the size, distribution and structure of African populations and applies this to an analysis of the demographic components in population changes, to provide an estimate of future trends in population. The paper concludes with an outline of the demographic information required for planning purposes.

The fourth of the papers submitted to the Working Party deals with "Some Problems of Social Development Planning in Relation to Economic Development". Social development, or the "improvement of the welfare of a population" (p. 82), to a large extent is conceived of as a process requiring the inter-action of economic development and redistribution of wealth and incomes. Economic development alone is regarded as insufficient, and, in turn, social development is frequently a pre-condition for the continuation of economic growth. Difficulties of measurement of social development are discussed, and the author points out that the concept can be measured only in terms of plural indices such as housing, social security, and literacy. One consequence of the difficulty of measurement may be, it is feared, the concentration of economic planning on those projects with the more tangible economic benefits. It is suggested that social development is of major importance with reference to improvements in human productivity, physical capacity for work, and motivation.

Even where the benefits of social development are widely appreciated, there is a significant problem in the development of a criterion for the allocation of severely limited capital and human resources between social and other forms of development. The author of this paper discusses a number of possible bases for such criteria, and the possible sources of finance for social action. The paper concludes with a review of the need for integration between plans for social and economic development.

The final paper in this Bulletin refers to the related topic of the "Social Aspects of Economic Development". This deals with the impact of economic development on social structure including the tendency for some disruption of traditional societies, and then proceeds to an outline of the interdependence between social and economic factors in development. The paper concludes with a review of some of the problems of adaptation of social and economic institutions to development and a list of suggestions for fields for future social and economic studies.

This Bulletin should be of wide general interest. However, most of the problems discussed must be viewed in a considerably different context if applied to the problems of development planning in Australia, and the technical approaches to planning are, in general, discussed in much more detail elsewhere in professional literature.

Department of Agriculture, Sydney S. J. FILAN