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De forslag, som kommissionen på grundlag af undersøgelsen fremsætter, falder i to grupper, den ene vedrørende forslag angående økonomisk hjælp, medens den anden vedrører rådgivning og oplysning. Der skal ikke her tages stilling til disse forslag, men alene bemærkes, at kommissionen har haft held til at påvise, at vi her har et af de områder, som er blevet forsømt under de senere års socialpolitiske indsats — og det måske mere end vore bange anelser har sagt os.

*Svend Aage Hansen.*

**Activity Analysis of Production and Allocation.** Edited by T. C. Koopmans. Cowles Commission for Research in Economics, Monograph No. 13. Wiley & Sons, New York 1952. 380 pp. \$ 4,50.

This volume contains 25 papers, all of which had been presented to a conference on "linear programming" held in Chicago in 1949. During the delay in writing this review some of the novelty of the contribution to economics of the "linear programming" school, which centers in the Cowles Commission, has worn off and one may be able to judge the results in better perspective.

The studies under review concern the efficient fitting together of the many interdependent activities of a large and complex undertaking, in the extreme case the economy as a whole. An "activity" is an economic process by which different "inputs" are combined to result in "output". Any "output" can, therefore, be expressed as a mathematical function of a number of "inputs". There is a departure from orthodox production theory in so far as an "activity" is rather narrowly defined. It may be possible to produce a given commodity by a number of alternative

"activities" but, in given circumstances, not more than one activity will be the optimum, that is, not more than one will be in actual use. The major problem of substitution of one factor of production for another is not treated as a movement along the production curve of orthodox theory but rather as the substitution of one "activity" for another. There is justification for this approach as, under conditions of modern machine production, substitution is usually the result of, or must be accompanied by, some change in the process of production.

Within this framework it is easy to see the legitimacy of the well-known assumption of linearity, that is, the assumption that, for any activity, output is a linear function of inputs. This is clearly a simplifying assumption, which is acceptable in any science as a first approximation, and it makes much of the mathematical analysis and the work of computation feasible. As against orthodox production theory, most of the nonlinearity of the production function is regarded as being due to heterogeneity, that is, to the combination, in varying proportions, of different elementary activities. The solution of many problems is possible only by basing the analysis directly on the elementary (linear) activities.

Linear programming is a post-war growth which has its origin in attempts to generalise the Walrasian system of economic equilibrium; in modern welfare economics; in the by now familiar work of Professor Leontief; and in specific programming problems which have been mathematically solved during the war. The immediate stimulus came undoubtedly from Leontief's successful attempt, from 1936 onwards, to analyse, in empirical terms, the economy as a whole, and from the controversies concerning his model. Much of the work of the linear programming school may be looked upon as an application of the Leontief model to special problems instead of to the economy as a whole; as an attempt to provide a

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theoretical basis for the Leontief model (the linearity of which he argued on practical rather than on theoretical grounds); and as a search for links between the mathematical techniques required for the solution of the Leontief model and similar techniques applied elsewhere. Undoubtedly the new school extends beyond economics, as qualification for membership requires only "a common interest in the formal problem of maximization of a linear function of variables subject to linear inequalities" (p. 5).

The general economic reader would be interested, one may suppose, first, in an exposition of the theory, second, in illustrations of its empirical application, and third, in the mathematical and computing techniques required for the solution of specific problems. These topics, however, only take up a small proportion of a volume of some 400 pages. A great deal of space is devoted to rigorous mathematical investigations of certain theoretical properties of linear systems, and to the mathematical properties of convex sets which are demonstrated to form the connecting link between linear programming and Neumann's theory of games. Most of this is likely to be beyond the interest of many students of economics.

The general reader, assuming that he is already familiar with Leontief's work on the American economy or with corresponding European studies, would do best by starting with Koopmans's exposition of the new theory of production (in Ch. III) and continuing with the statement of the problem by M. K. Wood and G. B. Dantzig (in Chs. I and II). These first three chapters (a total of about 80 pages) give a clear and elegant introduction to the system and to the mathematical solutions, and indicate fields of application. He can then turn directly to examples of application of the model to crop rotation plans, to the aircraft industry and air lifts, and to shipping (a total of another 80 pages in Chs. XI—XIV).

The chapters on application are, how-

ever, somewhat disappointing. As it is customary in recent econometric literature, these chapters are concerned, not unexpectedly, with the theory of application rather than with empirical investigation. C. Hildreth and S. Reiter show that the farmer's choice between different crop rotation plans can be reduced to a linear programming exercise. M. K. Wood and M. A. Geisler discuss problems of planning with special reference to the U. S. Air Force and throw interesting light on the strategy of decisions regarded as a choice between different programmes. T. C. Koopmans and S. Reiter show that, by the application of linear programming techniques, the optimum allocation of shipping between different ports and optimum freight rates can be determined, and give empirical solutions. In each of these chapters the treatment of the problem is efficient and suggests the superiority of scientific solutions over the method of trial and error which is generally adopted by farmers, businessmen and administrators. But the level of abstraction remains high and another volume ought to be written to convince, not only the general economist but also those responsible for decisions, that the linear programming technique has been or could be successfully applied in concrete cases.

T. Barna.

*Sven Røgind: Skatterne og de offentlige udgifter. Skatteteori og skattepolitik. Rosenkilde og Bagger 1954. 194 sider. Pris: 14,50 kr.*

I en årrække har J. Toftegaards — senere C. Ulrich Mortensens — »Vore Skatter« været en håndbog, hvortil de fleste tyede, når det gjaldt oplysning om skatter i Danmark. Med den foreliggende bog har Sven Røgind — ni år efter at sidste udgave af »Vore Skatter« så dagens lys — villet fremkomme med en afløser. Selv om der ikke i efterkrigstiden er sket afgørende ændringer i vort skattesystem, savnede man en samlet å jourført fremstilling af dette omfattende lovkompleks.