

Under the Philippines' present foreign exchange policy, exporting is disadvantageous and importing is advantageous. The author approves of this policy on the ground that it has served to hold down the agricultural aristocracy dependent on the export of primary products on the one hand, and, on the other, has facilitated the emergence of businessmen engaged in processing the imported raw materials or semifinished products. This policy, however, has hampered the diversification of the Philippines' export market and has stood in the way of her attaining a sound balance of international payments, raising the country's degree of dependence on foreign aid. Is this policy not exerting adverse effects on future development?

Finally, it is true that the Philippines' "conservative" political climate has proved effective in fostering a steady economic policy and in preventing radical reforms, but the reviewer cannot but wonder if the policy has not been "too conservative." Because of the strong influence of the agricultural aristocracy, it may have been difficult to carry out a land reform which would have made changes in the cacique system, but is it not "too conservative" to depend mostly on indirect taxation because the collection of the land tax is too difficult? In a country like the Philippines, where the rate of capital formation is low, fiscal policy has a large role to play in accumulating capital. If an adequate amount of land tax were collected, the Government would be able to help the industrialization process in a more positive manner. The reviewer cannot help thinking that if the Government remains so "conservative" as not to be able even to carry this out, one can scarcely entertain a very optimistic view of the country's economic development in the future. (*Keinosuke Baba*)

P.C. MAHALANOBIS, *The Approach of Operational Research to Planning in India*, London, Asia Publishing House, 1963, vi+168 p.

The main part of this book was originally written to explain the theoretical basis of the recommendations for the formulation of the Second Five-Year Plan submitted to the Prime Minister of India on 17th March, 1955. This document was published in *Sankhyā: The Indian Journal of Statistics* (Vol. 16, Parts 1 & 2, Dec. 1955, pp. 3-62). The revised version is now published in book form in order to make it more easily available to all who are interested in economic planning in India. The revised parts are mainly concerned with present conditions in India (Chapter 2).

This book is now one of the classics in the field of economic planning in India. No problem of Indian economic planning, especially in relation to the Second Five-Year Plan, can be discussed without reference to this book. However, for about ten years since the original publication of the document, many comments and criticisms have been concentrated on the theoretical model.

In reviewing this book, we shall concentrate our attention on its present

meaning, namely on the process of development of the Mahalanobis model.

Prof. R. Komiya in "A Note on Professor Mahalanobis' Model of Indian Economic Planning" (*Review of Economics and Statistics*, Vol. 41, No. 1, 1959, pp. 29-35), pointed out that the model was not based on any maximization principle. Prof. P.C. Mahalanobis and Prof. M. Mukherjee in "Operational Research Models used for Planning in India" (*ISI. P.D. WP/177 (253)*, Jan. 3, 1963) retorted that the model had an *essentially* operational character. Prof. S. Chakravarty in "The Mahalanobis Model of Development Planning" (*Arthaniti*, Vol. 1, No. 1, 1957, pp. 57-69), agreed that the Mahalanobis model was operational in character in the sense of Prof. J. Tinbergen (*Economic Policy: Principles and Designs*, Amsterdam, North Holland Publishing Co., 1956).

The theoretical model for constructing the frame of the Second Five-Year Plan is developed in Chapter 4. Here Prof. Mahalanobis develops two kinds of models: the two-sector model, a growth model, and the four-sector model, an investment allocation model.

The two-sector growth model is composed of an investment goods producing sector (*K*-sector) and a consumer goods producing sector (*C*-sector). In the four-sector investment allocation model, the *C*-sector is divided into three sub-sectors: factory production of consumer goods (*C*₁-sector), production of consumer goods, including agricultural products, in small and household industries (*C*₂-sector), and services such as health, education, etc. (*C*₃-sector). This classification follows the Keynesian aggregates. As Prof. S. Tsuru pointed out in "Some Theoretical Doubts on the Plan Frame" (*Economic Weekly*, Annual Number, Vol. IX, Nos. 3, 4 & 5, 1957, pp. 77-79), even if this sectoral classification is useful for the theoretical development of arguments, it may prove troublesome in actual application, such as the practical use in planning-models.

Considering the ratio of increment of income to investment in each sector, Prof. Mahalanobis constructs his growth model. Let Y_t be the national income at time t , and Y_0 the corresponding value in the initial period. λ_k and λ_c are fractions of investment allocated to the *K*-sector and *C*-sector respectively; $\lambda_k + \lambda_c = 1$. β_k and β_c are the ratios of increment of income to investment in the *K*-sector and *C*-sector respectively. And α_0 is the average rate of savings in the initial period. The Mahalanobis' fundamental equation of growth becomes

$$(1) \quad Y_t = Y_0 \left[1 + \alpha_0 \frac{\beta_k \lambda_k + \beta_c \lambda_c}{\beta_k \lambda_k} \left\{ (1 + \beta_k \lambda_k)^t - 1 \right\} \right].$$

The implication of this equation is as follows: the higher the fraction of total investment allocated to the *K*-sector, the higher the level of income in the long run.

The ratio of increment of income to investment holds only for the supply side of the system. Thus the growth model is one-sided in the sense that the system does not treat the demand side. This was also criticized by Prof. S. Tsuru (*ibid.*). However, it is not a fatal defect. Introducing the demand

side, the reviewer proposes the following relations :

$$(2) \quad s = \frac{\beta_k \lambda_k}{\beta_k \lambda_k + \beta_c \lambda_c}$$

$$(3) \quad \beta_k \lambda_k = s \beta \quad ; \quad \beta = \beta_k \lambda_k + \beta_c \lambda_c$$

where s stands for marginal rate of savings and β for global ratio of increment of income to investment. Thus the Mahalanobis' fundamental equation of growth could be rewritten as follows :

$$(4) \quad Y_t = Y_0 \left[1 + \frac{\alpha_0}{s} \left\{ (1 + s\beta)^t - 1 \right\} \right].$$

This equation implies that the higher the marginal rate of savings, the higher the level of income in the long run. In the relation (2), an increase of a fraction of the total investment allocated to the K -sector (λ_k) brings about an increase in the marginal rate of savings,

$$(5) \quad \frac{ds}{d\lambda_k} = \frac{\beta_c \beta_k}{\beta^2} > 0.$$

Then the modified Mahalanobis' growth model (4) implies that the higher the fraction λ_k , the higher the marginal rate of savings; and the higher the marginal rate of savings, the higher the level of income in the long run.

R. F. Harrod (*Towards a Dynamic Economics*, London, Macmillan, 1952) demonstrated that the rate of growth of income depends on the average rate of savings in the economy and the productivity of investment (the global ratio of increment of income to investment),

$$(6) \quad G = \alpha \beta,$$

where G stands for the rate of growth of income, α for the average rate of savings, and β for the productivity of investment. The productivity of investment can be influenced only to a limited extent by appropriate policies, because it is more or less technologically determined and thus cannot have much operational significance in stepping up the rate of growth of income. Therefore, the rate of growth of income can be increased only by raising the average rate of savings. This average rate of savings can be increased only if the marginal rate of savings is higher than the average rate of savings in the relevant time period. And the higher the marginal rate of saving in a time period, the higher the average rate of savings in the following time period. In the K , C_1 , C_2 , and C_3 -sectors respectively, let $(\Delta Y_k, \Delta Y_1, \Delta Y_2, \Delta Y_3)$ be the sectoral increases in income, $(\Delta N_k, \Delta N_1, \Delta N_2, \Delta N_3)$ the sectoral increases in employment, $(\lambda_k, \lambda_1, \lambda_2, \lambda_3)$ the fractions of total investment allocated, $(\beta_k, \beta_1, \beta_2, \beta_3)$ the ratios of increment of income to investment, and $(\theta_k, \theta_1, \theta_2, \theta_3)$ the net investment required per engaged person. ΔY and ΔN are the targets of increases of total income and total employment which must be attained within a finite time horizon (i.e., 5 years). And I stands for the total amount of investment available for this planning. Then Prof. Mahalanobis' investment allocation model is composed of the following twelve equations :

$$(7) \quad \Sigma \Delta Y_i = \Delta Y,$$

$$(8) \quad \Sigma \Delta N_i = \Delta N,$$

$$(9) \quad \Sigma \lambda_i = 1,$$

$$(10) \quad \Delta Y_i = \lambda_i \beta_i I \quad (i=k, 1, 2, 3),$$

$$(11) \quad \Delta N_i = \lambda_i I / \theta_i \quad (i=k, 1, 2, 3),$$

$$(12) \quad \lambda_k = 1/3.$$

According to Prof. Mahalanobis' explanations, these twelve equations uniquely determine the twelve unknowns ($\Delta Y_i, \Delta N_i, \lambda_i$). These values depend on both the targets and the data (I, λ_k).

Again, in this investment allocation model, the demand side is excluded. This was pointed out by Prof. A. K. Sen in "A Note on the Mahalanobis Model of Sectoral Planning," (*Arthaniti*, Vol. 1, No. 2, 1958, pp. 26-33), where he wrote that, in the model, increases in sectoral income were not linked with increases in sectoral demand. Completing the system, Sen suggested to give up the equation (12) and introduce three sectoral demand equations,

$$(13) \quad \Delta Y_i = f_i (\Delta Y, \Delta N) \quad (i=1, 2, 3),$$

in which are linked the increases in demand for three kinds of consumer goods and the increase in total income and/or total employment. We now have 14 equations and only 12 unknowns ($\Delta Y_i, \Delta N_i, \lambda_i$). The system is overdetermined. When, however, ΔY and ΔN are made variables rather than targets, the system becomes once again rightly determined. This means that if β 's and θ 's are given, and if demands for consumer goods are linked uniquely with total income and/or total employment, only a certain rise in income and a certain increase in employment are possible for the given total amount of investment. Then we cannot start with given ΔY and ΔN as our target; they will emerge as parts of the solution of the system.

The reviewer assumes, for simplicity, that those three sectoral demand equations are linked only with an increase in total income,

$$(13^*) \quad \Delta Y_i = c_i \Delta Y,$$

where c_i stands for the marginal propensity to consume for i -th consumer goods. Using these equations, the reduced form to determine the fractions of total investment allocated to the respective sectors (λ_i) is

$$(14) \quad \lambda_j \beta_j = c_j \sum \lambda_i \beta_i \quad (i=k, 1, 2, 3; \quad j=1, 2, 3),$$

$$1 = \sum \lambda_i \quad (i=k, 1, 2, 3).$$

With this simultaneous equations system, we establish the fractions to be determined as a function of the productivity of investment and the marginal propensity to consume,

$$(15) \quad \lambda_i = \phi_i (\beta_i, c_i).$$

This implies that the fractions are not affected by the level of total amount of investment.

In this modified Mahalanobis model (7), (8), (9), (10), (11) and (13*), the growth path of the national income is

$$(16) \quad Y_t = Y_0 \left[1 + \frac{\alpha_0}{s} \left\{ (1 + s\beta)^t - 1 \right\} \right],$$

where

$$s = \frac{\beta_k \lambda_k}{\beta_k \lambda_k + \beta_1 \lambda_1 + \beta_2 \lambda_2 + \beta_3 \lambda_3}.$$

As mentioned above, all λ 's are determined by parameters (β_i, c_i), which are

independent of the level of investment. So the growth path of the national income is determined only by the initial conditions (Y_0, α_0).

Thus, in a complete system with a demand side as well as a supply side, for the given values of parameters (β_i, α_i), no planner can select the growth path of the national income. The selection can be done only through changes in parameters.

We have shown above the characteristics and significance of the modified Mahalanobis model. We can expect some new developments of this model. For example, the planning model for the Third Five-Year Plan (cf. S. Chakravarty, "The Mathematical Framework of the Third Five-Year Plan," Chapter I (pp. 11–22) of *Capital Formation and Economic Development*, ed. by P. N. Rosenstein-Rodan, London, George Allen & Unwin, 1964) follows, the reviewer thinks, Prof. Mahalanobis' ideas on planning-models.

This book has thus played its role in stimulating the development of planning models in the Mahalanobis' line. (*Hikoji Katano*)

HSÜ TI-HSIN, *Chungkuo Kuotu Shihch'i Kuomin Chingchi ti Fenhsi, 1949–1957* (An Analysis of the Chinese National Economy in the Transition Period, 1949–1957), Peking, The People's Publishing Company, 1962, 287 p.

The first edition of this book was published under the title of *Wo Kuo Kuotu Shihch'i Kuomin Chingchi ti Fenhsi* (An Analysis of the National Economy of Our Country in the Transition Period), and has undergone two revisions since then. We may describe the process of revision in some detail as follows. The writing of the first edition was completed in January, 1957, and it was published in July of that year by the Scientific Publishing Company. In 1959 the first revised edition was published by the same company, the title being changed to *Chungkuo Kuotu Shihch'i Kuomin Chingchi ti Fenhsi* (An Analysis of the Chinese National Economy in the Transition Period) and sub-titled "Revised Edition, 1959."

In the preface to this work, written in January, 1959, the author says that the book has been revised and supplemented because it had become out of date in some respects, both in content and in point of view, as a result of such rapid developments and changes in the national economy as "the great leap forward" and the People's Communes. However, in 1962 a second revision was embodied in a third edition (the preface to which is dated "the end of October, 1961"), and this work, the subject of this review, was published by The People's Publishing Company. It would seem to be exceptional that such a work as this—an outline account of the development of the Chinese economy—should have undergone two revisions in this comparatively short space of time. Perhaps the great upheavals which have taken place in the Chinese economy itself, particularly in the period since 1958, lie in the background of these revisions. In his preface to the third edition the author says