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## Economic Change and Technical Structure

*by Iwao Ozaki*

This paper presents a number of empirical results obtained from our experiments which are concerning the basic studies of changes in input patterns together with concomitant changes in labor and capital inputs in the course of economic growth.

The main purposes of this study are as follows.

Fundamentally assuming the existence of one commodity-one plant relationship for production process of each commodity.

- a) the statistical tests for the assumption of the constancy of input-output coefficients regardless of changes in production scale.
- b) the empirical validity for the usefulness of factor-limitational type input function approximated by log-linear form.
- c) the considerations for the effects of plant-scale on changes in input-output coefficients, and
- d) the application of the above input functions to all sectors of Census of Manufactures (3-digit classification of industry).

In this study the individual establishment-base data of the Census of Manufactures, Japan 1965, were used as a sample point. As the result the relationships between commodity-base approach and establishment-base one were empirically observed in each section.

The results will be summarized as follows.

- i) In commodity-base approach, while the constancy of material input coefficients regardless of scale were statistically verified, the constancy of fuel, electric power, labor and capital input coefficients were statistically rejected in most sectors.
- ii) In a portion of "Iron and Steel" and "Non-ferrous metals" material-oriented complexes and a large portion of "Chemicals" material-oriented complex, the economies of scale were observed for material. These sectors were also characterized by the existences of large-scale-plant and capital-intensive techniques.

A much fuller analysis will be become possible when material input patterns in these sectors can be studied in more details.

- iii) In all sectors, the economies of scale were observed for labor input process.
- iv) Generally speaking, in most sectors with large-scale-plants, while the diseconomies of scale were observed for capital input process, the degrees of economies of scale for labor and material input process were larger than the other sectors.

These results would indirectly imply that i) while factor-substitution usually observed at macro-aggregate level may be due to changes in product-mix, substitutability of labor and capital at micro-disaggregate level may occur only through changes of production-scale, ii) the introduction of new concept such as "plant" in which fixed capital should be embodied may contribute to a more synthetic analysis of input-output analysis including not only intermediate inputs but also labor and capital requirements and iii) the effects of plant-scale also seems to be of crucial importance for the analysis of structural change.

## Technical Progress, Trade Balance, Terms of Trade and Real Income

*by Fusaji Takahashi*

Hicks first attempted to analyze the problem on secular dollar shortage in terms of equilibrium approach. Since then many controversies concerning theoretical validity of his propositions were developed. Throughout the controversies the restricted character of his model in which commodities are produced under condition of constant costs was into serious doubts. Most economists in their approaches to Hicks' propositions adopted two-country, two-goods model under increasing costs. Johnson, above all, pointed out the possibility of existence of ultra-biased case which Hicks overlooked, and Johnson and Corden analyzed the effects of impacts of economic growth on the change in terms of trade by applying Rybczynski's theorem. While Johnson's analysis was concerned with neutral technical progress, Findlay and Grubert, in particular, emphasized the necessity of analyzing the case where technical progress was non-neutral. It should be noted that these approaches were mainly verbal or geometrical. On the other hand, Amano, Takayama tried mathematical formulations of two-country, two-goods model

and analyzed the effect of technical progress on terms of trade respectively.

Meanwhile, Bhagwati analyzed the problem on the change in welfare of trading countries which was caused by change in terms of trade due to economic growth. But, overwhelmingly, the dollar shortage problem so far has been considered mainly with respect to the change in terms of trade.

The first aim of this paper is to give a survey on main contributions on dollar shortage problem connected with technical progress. The second aim is to attempt to generalize the theory on that problem. We shall deal with the problems on changes in terms of trade, trade balance and real income due to technical progress.