

## BOOK REVIEW

*Comparative Technology Choice in Development: The Indian and Japanese Cotton Textile Industries* by Keijiro Otsuka, Gustav Ranis, and Gary Saxonhouse, Basingstoke and London, Macmillan Press, 1988, viii + 247 pp.

### I

It seems to be widely recognized that the transfer of new technology from advanced countries and its adaptation to local conditions are of extreme importance for the successful industrialization of developing countries. However, in reality one often wonders under specific circumstances whether or not the people in developing country were sufficiently prepared with the technological capabilities required to facilitate the effective use and adoption of advanced technology from abroad. This book is a comparative case study of the cotton textile industries in Japan and India before the Second World War with respect to technology choice in relation to the given level of technology and socioeconomic conditions of the respective countries. The authors identify the different historical patterns of development in the cotton industry in the two countries and analyze the factors which caused such a difference, their scope covering more than half a century.

They ask themselves why it is that the range of techniques actually used in developed as well as developing countries at the present time is very narrow in spite of a wide variety of existing techniques and marked differences in factor endowment. The authors found that the general economic environment and specific incentives faced by decision-makers at the firm level determines to a significant extent the amount of attention paid to technological choice, the level and direction of investment, and the extent of innovative activities in science and engineering.

In the second chapter of the book, a brief description is made of the initial conditions and the subsequent development of the Indian and Japanese cotton textile industries. The industry in the two countries seemed to share similar initial conditions at the beginning of the 1880s when machine spinning was done by mules, mostly by male workers in single shifts. In the Japanese cotton spinning industry, however, after the end of 1880s ring spinning, which could be attended by less skilled female workers, began to replace mule spinning. The ring spindle accompanied with the related technological changes adjusting to rings almost completely took over in about ten years in the case of Japan. As the cotton industry expanded in Japan, the technology adopted there was flexibly geared to the most profitable use of the large surplus of labor, especially female hands. Such versatility in the use of technology was a major factor in the comparative advantage of the Japanese cotton industry over that of India, and in historical perspective Japan's selective and flexible adoption of technology seems to be an unusual example in the experience of industrialization in contemporary LDCs.

In the following two chapters, the development process of the cotton textile industries of the two countries are examined from the technological point of view. It is pointed out that there were four significant technological changes in Japan's case. First, the adoption of the two shift system in the use of labor force, which resulted in capital shallowing in the industry. Second, cotton yarns produced were reduced to those of

lower quality or coarser ones. They were better suited to the Japanese climate than the imported and indigeneous handspun yarns. Third, the rapid diffusion of ring machinery, requiring a workforce of lower skill than mule spinning, enabled the cotton industry to employ young female workers at lower wages. Fourth, by innovations in cotton mixing, the Japanese cotton firms could avoid the technological and economic difficulties which would have been caused by switching from mule to ring. The authors emphasize the importance of the linkage between the advancement of cotton mixing technique and ring diffusion, since ring spindles, suited to the Japanese factor endowment, would not have been possible without the ingenuity by which short-staple cotton was turned into quite desirable material. The authors regard "the development of the cotton-mixing technique as the key cause behind the successful transfer and adaptation of advanced foreign technology to Japan during the late nineteenth century" (p. 30).

Cotton mixing was also practised in India, but its purpose was different from that in Japan. Since the usage of domestic raw cotton long persisted in India, the application of cotton mixing was limited to a narrow range of staple length of raw cotton. Thus, despite the similar initial factor endowment, the rate of technological advancement of India in subsequent years lagged dramatically behind that of Japan. For example, capital-labor ratios in India were much higher than in Japan and they did not drop over a long period of time. It is argued that the relatively low productivity in the Indian cotton textile industry was mainly due to the lack of the cotton mixing-ring diffusion linkage comparable to that which occurred in Japan.

In Chapter 5, the central part of the book, an economic analysis is attempted of why the Japanese cotton textile industry was more successful than its Indian counterpart. The analysis revolves around the careful examination of changes in total factor productivity in the respective countries. There are a large number of factors considered in their analysis such as factor price distortions, organizational and institutional environment, the quality of the labor force, the functions and activities of industrial associations, the development of textile machinery manufacturers in the country, the number of patents registered in the cotton and related industries, and the relationship between the quality of inputs in production and the choice of technology. These intellectual exercises by the authors have produced a number of interesting insights with respect to technological borrowing and adaptation. For example, it is strategically important for economic development to maintain a competitive market free from government intervention, which tends to produce ample market pressure for entrepreneurs. Another factor which proved important was the early appearance and development of domestic textile machinery manufacturers together with the achievement of the technological capabilities as early as possible to be able to make sensible choices of the quality and kinds of raw materials and products most appropriate for the technology in use and the local conditions.

## II

One of the interesting characteristics of this work is its comparative approach to the historical study of industrial development, which has seldom been employed. However, most of the findings are not entirely new; rather they are a more stylized presentation of findings by previous works such as Professor Yukihiro Kiyokawa's.<sup>1</sup> The strength

<sup>1</sup> See, for example, "Technical Adaptation and Managerial Resources in India: A Study of the Experience of the Cotton Textile Industry from a Comparative Viewpoint," *Developing Economies*, Vol. 21, No. 2 (June 1983); "Entrepreneurship and Innovations in Japan: An

of this volume, however, lies in the comprehensive interpretation of the issue based on their collection and estimates of new data which were submitted to rigorous statistical examination with use of econometric operations.

One of the major arguments presented in this work is that the level of innovative activity measured in the study by the number of patents registered is one of the most influential determinants of differential technology choice. In fact about one third of the volume was dedicated to accounting for the relationship between the number of patents registered and total factor productivity in each country. Although this analysis carries a special importance to the whole study, there are several weakness in the analytical method employed for the inquiry. The causality of innovative activities is deduced directly from *watching* the correlation of the time-series variables without statistical tests. The Granger's causality test would have produced far more effective and reliable results.<sup>2</sup> In fact it is made use of by the authors elsewhere in this work (see Table 5.14).

Secondly, it is questionable whether or not the relationship between the number of patents and total factor productivity captures the dynamic interactions between causes and effects of industrialization in LDCs. As contemporary developing countries are heavily dependant on international technology transfer, so were Japan and India at that time. In this context, one wonders whether or not the number of patents sufficiently represents the incremental or cumulative effects of technological change, which is of central importance for productivity change in the technology receiving firm or country. As is duely emphasized by the authors, the cotton mixing technique is a good example of cumulative technological improvement.

Thirdly, what lessons can we learn from the experience of technology choice in the nineteenth century with respect to development strategy in the contemporary LDCs? Such conclusions of this study as the importance of market structure and macro-economic policies of the government are no doubt still valid today. However, one wonders whether or not the enormous complexity of technology at the present time produces a new set of issues in the technology transfer to developing countries, which did not exist in the past. Some discussion on such a point would have made the study more meaningful for contemporary efforts in development.

Finally, there are altogether sixty-nine tables and sixty figures in this compact volume. Many readers may wonder whether or not all these tables and figures had to be presented.  
(Fumio Makino)

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Implication of the Experience of Technological Development in the Textile Industry," *Developing Economies*, Vol. 22, No. 3 (September 1984); "Menkōgyō gijutsu no teichaku to kokusan-ka" [On the technology of cotton industry: ante-bellum Japanese case], *Keizai kenkyū*, Vol. 24, No. 2 (April 1973); and "Indo menkōgyō ni okeru gijutsu to shijō no keisei ni tsuite" [Technology and market formation in the Indian cotton textile industry], *Keizai kenkyū*, Vol. 27, Nos. 3 and 4 (July and October 1976).

<sup>2</sup> See G. Wyatt, *The Economics of Invention* (Sussex: Wheatsheaf, 1986), pp. 162-83.