

## INTRODUCTION

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**T**ECHNOLOGY transfer from the developed to the developing world has been attracting increasing attention in view of the positive role it is anticipated to play in accelerating economic development.

This special issue is devoted to highlighting some of the important problems and issues concerning the technology transfer from private Japanese firms to Asian developing countries.

All the papers carried in the present issue are the outcome of team studies conducted over the last few years and coordinated by the present writer. Of course, each author is fully responsible for his own contribution.

### I

Various definitions have been put forward in respect of international technology transfer. We define it simply as transfer of a technology from one country to another in different political, economic, social, and cultural contexts.

Needless to say we are concerned with technology that is directly related to upgrading the efficiency of economic activities. Such technology is embodied in physical products such as machines or plant, in man power, including skilled workers, engineers, and managers, and perhaps in management organization as well.

International technology transfer takes place through various channels; (a) passing on of the knowledge through literature, (b) free exchange of technological information between technicians at international conferences, (c) official development aid, (d) the international business activities of consultants, (e) export and import of plant and machinery, (f) technology transfer through direct foreign investment, and (g) mere technical licensing and other agreements.

The last four channels comprise the so-called commercial transfer of technology, and the last two are the main focus of our attention here. The commercial transfer involves payment of a direct and indirect price for technology and thus generates more complicated issues in the international arena than the noncommercial transfer. For instance, friction between the supplier and recipient of technology often arises in regard to price for, and range of technology supplied, teaching and learning attitudes, etc. Moreover, interaction between the supplier and recipient through technology transfer is a long process, unlike the transaction of a physical commodity. Therefore, the nature, method, and means of interaction can take various features, appropriate or inappropriate. We will presume here that the commercial transfer of technology commences when a technology

collaboration agreement is concluded between the company supplying the technology and the recipient company, and ends when the collaboration expires.

Our focus on the technology transfer from Japanese firms to developing Asian countries is justified on several counts. Confining ourselves to the developing Asian region can be justified by the fact that technology flow from Japan to that region is quantitatively very large. First, nearly half the amount of technology transfer by Japanese firms has been going to this region alone in the recent past.<sup>1</sup> Second, many Asian countries depend heavily upon Japan for technology import.<sup>2</sup>

There are several reasons to focus on Japanese firms, as will be elucidated below.

## II

We have had the hypothesis that, as a corollary to the so-called Japanese style of management, the nurturing process of technology by Japanese firms would also assume a Japanese dimension. Industrial technology, in a broad sense, consists of hard and soft aspects with the latter inevitably including the skill of workers and resourcefulness of engineers. Formation of skill and resourcefulness would assume a different style in accordance with different managerial organization. And if the nurturing process of technology in Japan is of a distinct type, it should perhaps in turn result in the formation of a Japanese style of industrial technology, with several features different from the technology developed and put to actual use in many other countries.

What is the so-called Japanese style of management and technology then? A heated discussion is continuing within and without Japan about the basic concept or elements of the Japanese style of management. Usually the following three factors are considered to be basic to it: seniority, lifetime commitment, and enterprise unionism. If the Japanese style of nurturing technology and the nature of nurtured technology are to be explained, these factors, particularly lifetime commitment, deserve special attention.

It is widely acknowledged that job-hopping is rare in the case of large companies

<sup>1</sup> According to published and unpublished statistics compiled by the Statistics Bureau, the Management and Coordination Agency, Government of Japan, Japanese firms received in 1973 41.5 billion yen for export of technology, out of which developing Asian countries occupied 20.8 billion yen (50 per cent). The corresponding figures for 1983 were 240.9 billion yen, 101.9 billion yen (42 per cent of all) respectively. Country-wise, the corresponding figure for the Republic of Korea was 17.0, Taiwan 10.8, China 18.4, Indonesia 15.8, and India 3.4 billion yen.

<sup>2</sup> As of 1982, the Republic of Korea imported from Japan 53 per cent, in terms of number of collaborations, of its total imports of technology from abroad. The corresponding figures for Taiwan, Malaysia, and India were 54, 35, and 9 per cent respectively. See Institute of Developing Economies, "The Study on Technology and Trade Frictions between Japan and Developing Nations and on International Division of Labor in the Future with Special Reference to Technology Transfer from Japan to ESCAP Developing Nations," A report submitted to Economic Planning Agency, Government of Japan (Tokyo, Institute of Developing Economies, 1985), p. 6.

in Japan. Skill and resourcefulness are nurtured in the same company during the entire span of the working life of the employee. If the employees job-hop, to the contrary, the skill and know-how they have acquired flow out into different streams. Job-hoppings create a homogeneity among various companies in terms of job description, engineering procedures, and work specifications. But this kind of technology assimilation has been largely absent in the recent Japan. Every organization develops and accumulates its own unique manufacturing know-how embodied in its employees.

At the same time, life-time employment obviates the need to rigorously define every job in black and white, for every employee knows by long experience what to do, what not to do, and, more importantly, how to do. For the same reason, many documents such as job procedures and operation manuals are unnecessary.

Very often, a job rotation system is introduced, where a worker or engineer is placed in a different job every two years or so. Over the course of time every one becomes familiar with various jobs, to become multi-skilled worker or engineer. A turner can be shifted to boring, grinding, or milling. Engineers who have graduated from the top universities are rotated through various jobs which might not be their own specialized field. They are given the chance to learning, or often are obliged to learn, skilled workers' jobs such as surveying, piping, repairs, welding, etc. and even obtain governmental or semi-governmental qualifications for such jobs. In a nutshell, there is a lot of intra-firm mobility of workers and engineers and they acquire multiple skills under the lifetime employment system.

Another feature of Japan, which bears some relation to the Japanese style of technology formation, is a unique inter-firm business relationship. This has been pinpointed by Professor Y. Torii et al.<sup>3</sup> Japanese firms tend to prefer long-standing business relations with other reliable firms. A firm which gets orders from another firm will never let down or cheat the ordering firm, so that both parties enjoy a long standing business relationship based on mutual trust. Thus it becomes unnecessary in Japan for the ordering firms to specify details every time in the contract with respect to ordinary manufacturing processes, unlike in other countries. This in turn allows every manufacturer to develop, retain, and accumulate its own unique manufacturing know-how.

In other words, less emphasis is placed on documentation and contract in Japan. And this absence of strictly defined documents causes no problems in Japan, but has no currency in international transactions. It is quite possible that it causes friction in the process of technology transfer to firms in other Asian

<sup>3</sup> See Engineering Advancement Association of Japan, Indonesia Technology Transfer Committee, "Technology Transfer of Japanese Engineering Firms in Indonesia," mimeographed (Tokyo, 1986). A Japanese engineer in a large Japanese engineering contracting firm, with a long experience abroad, has elucidated the uniqueness of the Japanese style of work organization, job description, specifications, business transaction, etc. See K. Takaiwa, *Abudabi de kaita seikōsuru kaigai bijinesu* [How to succeed in overseas business] (Tokyo: Jitsugyō-no-nihon-sha, 1981).

countries which are used to the Western style of management and business transactions.

### III

Some of the possible problems which may arise out of the transfer of Japanese technology based on Japanese management and work organization to different firms in different settings are explained in the paper by T. Hattori in this issue. He draws special attention to the mutual relationship between the engineer and worker. The friction caused by, and the reasons behind, the lack of documentation is dealt with in H. Washio's paper. These two authors have wide knowledge about different cases of Japanese collaboration with Korean and Thai firms but have also incorporated other cases of collaboration into their argument.

Any study of international technology transfer has to cover various aspects involved. Strong arguments have been put forward around the world in respect of the kind and level of technology to be transferred, channels and forms of transfer, price and cost of transfer, length of collaboration, etc. Everyone is, however, of one mind as to the role that technology transfer should play; the ultimate objective is to realize the technological self-reliance of the developing country.

S. Itō's paper is concerned with the vital role that modification of imported technology plays in raising technological capability toward technological self-reliance. He has in mind the experience of Japanese technology development, as discussed by S. Ishikawa, T. Hayashi, and others.<sup>4</sup> Cases of technology transfer from Japanese firms to India were taken up since India is known to have produced a number of resourceful engineers. Based on three rounds of Japan-India technology transfer case studies conducted by him and his associates, he tries to establish what are the right conditions for improving on foreign technology.

Many developing countries are pursuing, understandably, a policy of "nationalization" of technology provided by Japanese or other foreign firms. But this has not yet yielded the expected results. H. Fujimori is concerned with this aspect of technology transfer. He maintains in his paper that in the commercial transfer of technology, the size of the market for any product is a vital factor. His arguments are based on his observations on the Philippine automobile industry.

We have invited two writers to contribute survey articles concerning the academic arguments in the field of technology transfer in China and Japan.

The case of China is attracting a great deal of attention these days. R. Ikegami reviews the evolution of new streams of academic thought accompanying the new policies adopted by that country in the 1980s in respect of technology import.

F. Komoda reviews the evolution of the arguments in Japan in relation to

<sup>4</sup> See S. Ishikawa, *Essays on Technology, Employment and Institutions in Economic Development* (Tokyo: Kinokuniya, 1981), Chapter 4; and T. Hayashi, ed., "Project on Technology Transfer, Transformation, and Development: The Japanese Experience—Final Report," mimeographed (Tokyo: United Nations University, 1984).

the development of the Japanese economy, as well as the evolution of the world-wide arguments about technology transfer.

Y. Ikemoto's paper is apparently of a different nature. He is concerned with the extent to which technological progress is important in economic growth in ten Asian countries. Ikemoto's total factor productivity analysis proves that technological progress contributes greatly to GDP growth. He maintains, through a cross-country analysis, that an economy even at a low level of technology can enjoy technological progress. And the role of technology increases as the technology level rises, and then decrease as technology reaches a higher level. It appears to me as if a large amount of the technology transferred from Japan has, to a large extent, supported the remarkable growth of Asian countries, particularly the East Asian NICs.