of the cost of inaction. Australian history shows that the relaxed option has failed. Government must set out a vision of the future and establish a capacity to respond to clearly established needs. (pp. 159-160)

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Technology Absorption in Indian Industry *edited by Ashok V. Desai* (Wiley Eastern Limited, New Delhi, 1988) pp. x + 210, $US10.00, ISBN 81-224-0051-5

This volume is a collection of essays on the technological performance of Indian industry under given industrial, trade and technology policies. All of the essays, except one, were published in *Economic and Political Weekly*, Special Number 1985. The significance of these articles being published as a book lies in the importance of the issues addressed to both developed and developing countries. Although the literature on technology transfer is prolific, there are very few empirircal studies, especially from the view point of developing countries. This book presents a valuable contribution.

The global trend towards liberalisation seen in direct foreign investment cannot be discerned as clearly in the field of transfer of technology. The regulation of transfer of technology emerged in the early 1970s in a few Asian and Latin American countries. Policies in these countries have been aimed primarily at reducing the costs of transfer of technology while simultaneously emphasising self-reliance and indigenous capability.

Kuznets has pointed to the importance of the interplay of technology and existing institutions as the basic forces in economic growth. In the interplay of technology and institutions, it is the latter that is dominant.[1] The series of articles in the book implicitly attempt to test this thesis empirically. The collection is thematically well organised and reads well.

India has been a leader in the formulation of defensive and restrictive policies. It is, therefore, opportune that the studies looking at various aspects of technology imports in the country, both by Indian researchers and European researchers, have been put together at a juncture when the country is itself questioning technological performance and technology obsolescence in industry. The book is also timely since technological factors have become increasingly prominent in defining international competitiveness.

The six studies have a common thread in that the technological performance of Indian firms is found to have only a marginal relationship to technology policy. It is, in fact, dependent on the policies pertaining to the structure of the market and on those defining structures of industry. The conclusion of Cooper and Alam that, although technology policy has been remarkably successful in regulating the number of collaborations, its success in promoting technological development in Indian industry is questionable, is therefore not surprising.

Desai has been brutal, but not inaccurate, in asserting that public policies instituted by the government have created an environment of dependence and stagnation and not of self-reliance as planned. An industrial structure which is quite different from that of the technology innovators has had important implications for technology transfer to India.

The size of the domestic market in India has been smaller than that of the technology licensors. Together with policies which regulate competition, encourage small firms, and accord a privileged status to the public sector, this has made the Indian market unattractive from the viewpoint of technology exporters.

Besides, the technology policy originating from these political objectives and constraints has laid stress on the controls on payment for technology through ceilings, as well as restriction on duration of agreements as a primary objective. As a result, although the technology acquired by Indian firms was not obsolete, it is certain that the technology package was tailored to fit the price paid. The technology received was narrow and shallow. Accordingly, technological progress in Indian industry bears little or no semblance to the technology imports.

Desai mentions in the Conclusion that the interpretations of the paper are derived from a broader study of technology in India. This is obvious. The paper is an excellent exposition of issues and ideas arising out of what he terms the 'Indian industrial paradigm'. However, the link between them is, at times, tenuous and not very explicit.

Bell and Scott-Kemis have contributed two papers to the volume from their study of 93 Indo-British technology transfer agreements. These papers are particularly interesting because they have empirically tested the 'myths' associated with the transfer of technology to developing countries. They find evidence contrary to the notion, common in the developing countries, of a multinational corporation (MNC) using technology transfer as an expansionary strategy in the markets of the developing countries. Not only were the technology licensor firms not monopolistic, but they were also diverse in their sizes and strategies.

The Indian firms used their bargaining skills and the leverage they derive from the restrictive policies to exploit successfully the oligopolistic competition which existed between the supplier firms. Furthermore, in the majority of cases, it was demand for foreign technologies by Indian firms which led to these transfer agreements.

The entire emphasis of the importing firms was, however, on the price of the technology rather than on its size and quality. The latter was not even an element of negotiation. In over 50 per cent of the agreements, the objective of the Indian importer was just to acquire the capability to carry out the basic manufacturing activity in spite of the fact that over 75 per cent of the technology licensors were keen to transfer broader and deeper know-how and knowledge at the right price.

Thus it is difficult to assess if the Indian firms paid a lower price for the technology purchased compared with other countries because the size and quality of the technology package are important considerations in the agreement. The technology received by the Indian firms may have been of current vintage at the time of the agreement, but in all the cases studied "the technology was about to be outdated" (p. 56).

The technology transfer agreements are dependent on the portfolio of diverse objectives of the supplier firms and that of the recipients, their relative bargaining powers and on the existing public policy regime. The inadequacy of the technology policy, by itself, in defining the contracts is obvious from the fact that over 33 per cent of the licensors did not even feel it necessary to include the limited forms

of export restriction permitted by the Indian government in the contract because they did not expect the Indian importers to be internationally competitive in a short span of three to four years. It is therefore not only misleading, but also incorrect, to blame the lack of technology dynamism in India entirely on the "reluctance on the part of the foreign collaborators to impart capability required for efficient adaptation and assimilation" (p. 75).

Cooper's study was not one of the original articles in the *Economic and Political Weekly*. It is insightful and its addition to this volume is very relevant. His empirical study, based on the role of European firms (particularly that of Benelux collaborating firms) in the supply of technology to India, suggests that such firms judge the success of technical collaboration agreements in terms of the financial returns they get. Contrary to the conclusion of Scott-Kemis, Cooper found that there were a few Indian firms which were disappointed with their European partners because of the limited extent of technological assistance provided. However, he agrees that this may have been because of an insufficient price paid for the technology.

Normally large European firms tend to collaborate with large Indian firms. It is when small non-MNC European firms collaborate with small Indian firms that the majority of cases of discontent and/or failure of technology transfer agreements arise.

The European firms were dissatisfied with the slowness with which approvals for technology transfer were granted. On an average it took about 9 months to obtain approval, which, frequently, required renegotiations with the government. His study also finds the restrictive technology policy to be inadequate and ineffective in attaining the objective of self-reliance. His study agrees with the finding of Bell and Scott-Kemis that over 50 per cent of the technology transfer agreements were outside the MNCs. In addition, these agreements were initiated by the owners of the Indian firms. He uses an econometric model to show that the technology demand factors in India are related to the industrial investment demand, which in turn defines the quantity and time pattern of technical collaborations. It is for this reason that despite restrictive technology policy in India there was not a fall in the total number of collaborations. Cooper contends that there are limits to self-relilance. With industrial production becoming increasingly technology intensive, it is practically impossible for any country to be closed to foreign technology and yet be internationally competitive.

He observes that liberalisation of Indian policy regarding technology imports is desirable. It will serve to increase demand for the European technology. However, this liberalisation of policies by India has to be reciprocated by the European governments and European Commission (EC). They have to ensure that technology deals with India have no more restrictive element than if the collaboration was between firms within the EC.

Ghayur Alam's analysis, though less rigorous, is categorical in concluding that the responsibility of importing small technology packages lies entirely with the Indian firms. In agreement with Bell and Scott-Kemis, he observes that the Indian licensee firms bargain for keeping the import content of the technology transfer low so as to reduce the cost of technology transfer, and not because of government restrictions.

A lack of emphasis on the acquisition of the skills and experience necessary for absorbing the basic knowledge and for facilitating the process of technology diffusion has resulted in shallow technological progress by Indian firms. This comparison holds true not only with their technology collaborators, but also with

respect to firms in other countries that imported technology at about the same time. Consequently, technology policy has been quite ineffective except in reducing the period of collaboration and costs. The reason for that, he concludes in keeping with Desai, lies in the nature of the Indian market and Indian industrial structure. The liberalisation of technology may therefore be a necessary condition for the import of larger technology packages, but it is definitely not a sufficient condition. The policies directed at technological development can be successful only if they are accompanied by policies aimed at creating an environment salubrious to innovative activities.

The final essay by Charles Edquist and Staffan Jacobsson is particularly interesting for two reasons. It analyses the effect of state policies on firm strategies and firm performance by a case study of two specific products — hydraulic excavators and machining centres. A comparison is then made between state policies and firm performance in India and the Republic of Korea (ROK) in the development of these products.

They believe that state intervention is necessary in third world countries, particularly for the initiation and promotion of complex products. However, this intervention cannot be pursued independently of the international techno-economic status of the product and without acknowledging the significance of the domestic market and associated industrial environment. They conclude from their analysis that Indian industry has performed poorly compared with Korean industry and, generally speaking, unsatisfactorily in the case of both hydraulic excavators and machining centres. The reasons, far from being simple, lie in the structure of Indian industry and the structure of incentives arising out of Indian trade and industrial policies.

Although both the countries used identical policies on imports, with quantitative restrictions as the dominant feature, the Indian policymakers failed to provide preferential credits to producers of machinery. Besides, the Indian government failed to promote demand for the end products by supplying credits to the final users. As a result, the Indian firms failed to achieve economies of scale. In addition, even the prices of these raw materials were much higher than those of their Korean counterparts.

These factors resulted in an inward-looking strategy for the Indian machine industry. This inward-looking strategy, in turn, led to a strategy of over-diversification of output. The combined effect of these policies made exports a virtual impossibility and dependence on foreign technology a sheer necessity. Korea, on the other hand, has succeeded, through risk reduction policies of preferential loans and import restrictions, in creating an industrial structure which is heavily export oriented. This served as an incentive for firms in the ROK to develop design capabilities to achieve international competitiveness.

The Indian licensing system is complicated. It becomes more so administratively because of the involvement of a large number of official agencies. Consequently, good engineers, who are plentiful in India, end up spending a major portion of their time trying to understand government regulations and directives. The policy objectives of 'indigenisation' and self-reliance keep them busy with R&D to find substitutes for raw materials and imported components.

A solution, they perceive, lies not only in liberalisation policies, but in policies which are firm-specific and function-specific. The latter, *per se*, may or may not be restrictive. An important criterion is to define policy instruments which are consistent with the strategy chosen by the firm.

As is obvious from the discussion, the book contains an interesting and insightful

collection of papers. A wide range of empirical ground has been covered in the analysis. In addition, the book raises numerous issues which require further research and attention. Overall, I feel that this is definitely a book to be read by policymakers as well as researchers working in this field. However, it would have benefited from another bout of editing.

REFERENCE

1. Simon K. Kusnets, *Economic Growth, Rate, Structure and Spread*, New Haven, 1966.

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On the Applicability of Computerized Production Control in an Egyptian Industry
by Pär Lind
(Royal Institute of Technology, Stockholm, 1988) pp. x + 215, ISBN 91-7170-926-6

It is always worthwhile to ask whether a particular computer system is an appropriate solution to a problem. It is a question rarely addressed in due seriousness. In this book, Lind asks whether computerised production control is applicable in the context of the Egyptian vehicle manufacturing industry, a single nationally-owned company called NASCO, the El Nasr Automotive Company. It is central to the author's concern that Egypt is a developing nation while the production control systems in question are products of advanced industrial societies. The issue is whether the assumptions that underlie computerised production control, and which are necessary to its effectiveness, are actually appropriate to NASCO. If not, then the computerised approach is not applicable.

NASCO manufactures and assembles trucks, tractors, buses and cars under licence from overseas manufacturers. Two-thirds of the components used are produced in Egypt, half by local suppliers, the other half by NASCO itself. The remaining components are imported. NASCO's production control process involves determining the items required for assembly of a product, acquiring them, and storing them. Thus, product descriptions are used to list the required parts. Quantities are calculated, and, by reference to existing data about lead times, order dates are set. The same information base tells the planners about the source of parts. Once orders have been placed, the supply process needs to be controlled, from the transport of the parts from the supplier to quality control inspection, and finally to updating the stock records or directing the supplies to a job shop. Controlling the in-house manufacture of parts includes capacity planning, resource utilisation and maintenance, as well as tracking the job flow. These are activities for which computer-based support would seem natural to a large manufacturing company.

The main analysis of the book centres on the applicability of a centralised, integrated production control system — IBM's Communication Oriented Production Information and Control System (COPICS) — which was considered