

FRANCES STEWART:

TECHNOLOGY AND UNDERDEVELOPMENT

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A major aim of the book is to explore the impact of technology on development. In doing this the author discusses simultaneously two intertwined themes i.e. the consideration of how technology is affecting the less developed countries (LDCs) and the treatment of these matters in economic theory. Most of the first part of the book deals with macro aspects of technology and under-development and the latter part of the book focuses on microeconomic studies of the issues discussed at the macro level.

In chapter one the author lays ground for the theoretical framework. The analysis of technological choice is pursued in three stages (i) historical determinants of the total technology available in the world (ii) the technology available to a single country (iii) the technology in use in the country. The author correctly argues that total technology available (and its characteristics) is conditioned by historic and economic circumstances; these are classified into organization of production, income levels (and distribution) and technical factors. These classifications are maintained through the book and the associated interdependencies are clearly demonstrated. Recognising that technology available to a country is only part of the total technology available in the world, the difference is attributed to obsolescence, the sources of which are discussed. The author argues that the relevance of the source of obsolescence varies according to the nature of the economy. It is further argued that of all the techniques available to a country the techniques actually in use are a function of the selection mechanisms. Here the author is of the opinion that the choice of technology actually depends on the nature of the decision makers who differ in their objectives and in the nature of constraints facing them. At the end of the chapter the author compares her model with the neoclassical model of technological choice and shows that the latter is a special case of the one she develops.

In chapter two the author discusses the conceptual differences in approaches towards the employment problem and how these give rise to alternative approaches towards technology. A critical discussion of the marginal product approaches and the poverty approaches are followed by a discussion of specific relationships between the employment concepts and technology. It is contended that explanations of employment problems in LDCs on the basis of distorted factor prices or the factor proportions problem concentrate on the modern sector alone as if it is the only sector that matters for employment generation. The alternative technologies approach is commended for its concern to improve the productivity and work opportunities in the traditional sector as well as modifying technology in the modern sector. On taking a dynamic approach to the employment problem the author illustrates by calculations the point that definition and measurement of static employment situations may be dwarfed by dynamic trends.

Chapter three shows how the historical development of technology has led to the use of inappropriate technologies in LDCs and the implications on the patterns of development. It is the opinion of the author that inappropriateness arises from differences in the economic and institutional environment between developed countries and the LDCs. These differences are clearly analysed in three aspects (i) organization of production where it is argued that scale, specialization and management techniques are cause and product of technical change (ii) income levels are shown to be crucial in the sense that high income societies tend to develop technologies which require high savings (and investment) per head and recent and sophisticated techniques generate high income group products. (iii) skill requirements of the advanced country technologies are only consistent with the advanced country educational system a product of vast educational and training expenditures. The concept of technology package is applied in this chapter to explain the reliance on imported inputs, expenditures on supportive activities of imported technology and the inefficiency of some of these technologies. The author argues that the advanced country technology is likely to be more inappropriate over time. As evidence to back this argument the author shows different and changing characteristics of different vintages. On this point the author seems to assume dynamism on the part of advanced countries and absence of the same in LDCs. (she does not show, for instance, whether the 1950 vintage was more inappropriate in 1950 to LDCs than the 1970 vintage was to LDCs in 1970). The concept of technology as a package or system is admirably adopted to demonstrate biases in the selection mechanisms. In view of the complexities and interdependencies involved in the selection mechanisms the neoclassical concentration on factor prices is successfully shown to be an inadequate determinant of technological choice. The discussion about inappropriate technology is concluded by pointing out that the way out may require a critical change in the distribution of income and in the resource control of different decision makers.

In chapter four the author considers the characteristics of appropriate technology. Here the author carefully cautions that the appropriateness of a technology may depend on the sector (modern or traditional) it is to be associated with, as may be the kind of technology research conducted. This admirably offers a compromise between the Intermediate Technology Group and the Strachclyde group. The author identified appropriate investment intensity by the level which is average for the economy as a whole. This definition seems to be valid only as a very preliminary or first approximation of reality which can hardly be useful for policy purposes since choice of technology may have to be sectoral or by industry in which case the appropriate investment intensity would have to depend on the type of sector or industry for which technological choice is made. In this chapter characteristics of appropriate technology are identified with scale, rural/urban relationships, simplicity, appropriate products and the linkage effects. It is admitted that appropriate technology may not be achievable because of problems associated with the historical (and current) development of technology and the socioeconomic structure of the LDCs. The ultimate answer, the author believes is to be found in the realm of politics.

However, the next three chapters are devoted to a discussion of the necessary conditions (for attaining appropriate technology) in the realm of economics and technology.

The author argues that technology dependence is the most critical aspect of the whole dependency relationship between developed countries and LDCs. The characteristics and consequences of technological dependence are discussed in chapter five. To reduce technological dependence the author points to the strategy of controlling technology imports and that of reducing technology imports.

In chapter six the different approaches to the capital goods industries are explored. On the various approaches the author remarks "It seems likely that most LDCs will come up against absorptive capacity and savings constraints before: **rigid foreign exchange limitations and special build up of heavy industry would not** therefore be justified" (p.151). This claim is not backed with sufficient evidence yet it is not this basis that she commends the neoclassical position which permits a premium on savings and no premium on the capital goods industry. Although it may not be obvious that "all the models discussed have assumed away the problem of technology" (p.151) (the use of the Feldman model in the Soviet Union clearly did not ignore technological considerations) the models do not explicitly bring out the relationship between technology and the capital goods industry. This is a significant contribution she makes though briefly and in some places a bit too sketchy. Using the Indian experience the author warns that this sector is a necessary but not sufficient condition for change to appropriate technology.

The task of chapter seven is to consider the relationship between trade, development and technology. The author criticizes the convention theories of international trade which take technology as a parameter of the system. She proceeds to a commendable and critical evaluation of the various approaches which question the Heckscher-Ohlin and the Samuelson-Stolper assumptions with particular reference to the ability of these approaches in explaining the pattern and direction of international trade. With the help of the concepts developed in earlier chapters the author develops the contention that it is not possible to attain appropriate technology on the basis of trade (in inappropriate products) with the advanced countries. At this point the case for the South-South trade (among LDCs) is argued. With due consideration of the obstacles to South-South trade the author proceeds to argue for "aggregate schemes which could encourage third world trading links, without requiring a great deal of on-going cooperation" p. 177. The schemes (credit union among South countries, scheme for the issue of international money and joint devaluation policy) however, seem to require a good amount (if not a great deal) of on-going cooperation.

In chapter eight, where the author surveys the major findings of empirical studies, she argues that most of these studies have been primarily concerned to determine the neoclassical vs the technological determinism debate and with the surplus maximization debate. These and the two case studies i.e. Maize grinding in Kenya (chapter 9) and cement block manufacture in Kenya (chapter 10) are presented to high-light evidence about macro-issues discussed in the first seven chapters.

The falsity of the dichotomy between methods of production and products is clearly demonstrated all through the book. The author systematically presents the theoretical framework and the empirical studies to make this point. Nevertheless (probably with the vigour to give a strong blow to the dichotomy) the author tends to the other extreme to say "each technique produces a particular product" p.20. Surely, empirical studies have shown that having specified the product the choice (though more limited) is not ruled out. In fact even the empirical studies presented in the book point to the fact that product specification in some cases limits the choice further without necessarily ruling it out.

Through the book the author adopts a rather rigid relationship between high income products and investment intensity. The case of high class hand-made products and common examples given by Morawetz¹ point to a more flexible view of this relationship.

The author correctly refers to several characteristics of products and production technologies. However, the frequent identification of inappropriate products with high incomes and inappropriate technologies with high investment intensity not only in the conceptual framework but also in several other places in the book somewhat tend to reduce the impact of what would seem to be her contention that several characteristics are associated with different technologies.

On the whole the clear and systematic presentation of the impact of technology on the development patterns particularly in the LDCs is highly commendable. It is well argued that once the investigation of technology is extended to the range of different ways of meeting broadly defined needs, the range of available techniques is considerably extended. The concept of technology as a package is used to show the bias inherent in the selection mechanisms and how this contributes to the technological dependence and further to general dependence. The conditions which are likely to make a move to an alternative path are spelt out at the level of the international trading system and at the level of developing the local capital goods capacity. At both levels the book demonstrates that local technological innovation requires orientation towards more appropriate products and local needs.

S.M. WANGWE.