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[Book Review of] Microelectronics, automation and employment in the automobile industry, Susumu Watanabe (Ed.): Chichester, Wiley, 1987

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for macro policy in the short run" (p. 133). Hence, almost no direct comparisons are feasible. Contrary to most Latin American countries, Korea used foreign borrowing to finance investment in the long run and in the short run to bring in external resources to offset external crises.

Taylor's conclusion of the country studies is that "one may wonder if certain policies are more appropriate to some types of countries than others... Much depends on current institutional and political circumstances in the economy at hand. Indeed, that should be the main lesson from the country studies" (p. 144).

Chapter 5, the final chapter, attempts to assess the rationale for either an "orthodox" (or monetarist) or a "new-structuralist" stabilization programme. As Taylor puts it, "one or the other of these theories applies better, depending on the circumstances" (p. 149). More precisely, he states that "inflation (for example) better approximates the monetarist model if most markets in the economy are price-clearing... and indexation of nominal payments is not widespread. Mark-up or administered pricing plus indexation support inflations along structuralist lines" (p. 149). Thus, a structuralist model is called for. However, Taylor's criticism of the IMF's financial programming goes too far when he states that it "is an internally consistent way of looking at the economy. Its major problems are that it ignores... output variation and determination of prices from the side of costs" (p. 159). He feels that the only way to make financial programming complete is to add (at least) one price formation equation which includes the mark-up rule and an income generation equation, so that "output is not predetermined" (p. 160).

Surprisingly enough, the reader's final impression is that both sides are far less separate from each other than was previously believed. The new-structuralists have admitted the existence of 'flex' prices in developing countries, while the 'school of orthodoxy' has meanwhile started to consider such economic structure features as the informal credit markets (see IMF Occasional Paper No. 55, Theoretical Aspects of the Design of Fund Supported Adjustment Programs. Washington, D.C., Sept. 1987, pp. 18–24). One need not become "new-structuralist" to welcome Lance Taylor's contribution to a better mutual understanding.

Friedrich L. Sell

Watanabe, Susumu (Ed.), Microelectronics, Automation and Employment in the Automobile Industry. Chichester 1987. John Wiley & Sons. XIX, 203 pp.

The study edited by Susumu Watanabe is part of a research project within the International Labour Office's Technology Programme. The project is designed to examine at the sector level the impact of new technologies on employment and on the international division of labour in both industrialized and developing countries. The automobile industry has been chosen for the first comparative country study because this industry is one of the major users of microelectronic equipment such as NC machines and robots. The focus is on providing empirical evidence in order to clarify the ongoing controversy about the employment impact of microelectronics.

The volume contains an introduction by the editor, a presentation on the technicalities of microelectronic machinery (*Warren Seering*), five case studies on Japan, France (*Susumu Watanabe*), the United States (*Bruce T. Allen*), Italy (*Francesco Silva, Piero Ferri,* and *Aldo Enrietti*), and Brazil (*José Ricardo Tauile*), as well as a synthesis of the findings (*Susumu Watanabe*).

From the engineer's viewpoint, Seering discusses how robotics and NC machine tools have evolved, what are their technical advantages and limitations vis-à-vis human

workers and conventional machines, and what one might be able to anticipate from them in the future. He explains why the rate of diffusion and the areas of application of microelectronic machines have been much more limited than people tended to expect when they appeared. The author suggests that the impact of the new technology on working environment largely depends on how it is used.

The country studies are intended to contribute to the building up of a more reliable empirical data base. The following questions are explored:

- To what extent and in what production processes has the microelectronic technology been applied?
- For what purposes or reasons is it used?
- How has its application affected employment at the levels of production lines, individual firms, and the industry as a whole?
- What are the causes of the differences in the labour-saving effect of the new technology among different countries and among firms within the same country?
- What are the major constraints on the diffusion of the new technology, and what is the prospect for the future?

The principal findings of the country studies can be summarized as follows. Although it proved extremely difficult to isolate the employment effects of the new technology, the general conclusion is that microelectronic machinery can hardly be considered as a major cause of the job losses that took place in North American and West European automobile industries after the late 1970s. More fundamental causes are the reduction of automobile production and the general rationalization programmes. The rate of diffusion of microelectronic machinery has been much slower than anticipated, and its systematic application is rare.

The authors of the study correctly argue that the impact of microelectronic technology on employment at the industry or enterprise level tends to be overstated by other observers in two respects. First of all, labour-saving effects are exaggerated because assessments are typically based on observations at major plants; possibilities of different modes of application by smaller firms and underutilization of the new machinery installed are largely ignored in the literature. More importantly, previous studies often neglect compensating effects: (*i*) To some extent, labour-saving in the production process is offset by increased programming and maintenance work; (*ii*) at the enterprise level, the very flexibility of microelectronic machinery tends to augment the average amount of work per vehicle by encouraging product differentiation and shortening of the product cycle (work-amplifying effect). Even though the overall employment level in an industry or enterprise is not affected significantly, job security of individual workers is threatened if they fail to adapt themselves to the technological progress. Therefore, intensified training as well as workers' occupational and locational mobility are called for by the authors.

Evidence presented in the study suggests that higher efficiency in capital utilization, better or more regular quality of product, and higher product values were more important considerations in applying microelectronics in automobile production than labour-saving. But the case studies also point to significant inter-country differences in the labour-saving effect of the new technology. Labour replacement has been much more limited in Japan than elsewhere. This is partly because robotization in material handling, which is most labour-saving in other countries, is almost non-existent in Japan (where robots are employed mostly for welding and painting). But the crucially important factors determining the employment effects of the new technology are the degree of "fixed" automation (based on special-purpose machines and transfer machines) and the efficiency of work organization that existed before the introduction of microelectronics. Japan was clearly most advanced in these respects by the early 1970s.

Interestingly enough, Tauile argues that NC machine tools create a significant labour-saving effect in Brazil – notwithstanding that wage rates are low and the new technology is still rare in this country. Multinational companies engaged in Brazil are said to have introduced NC machine tools essentially as a means of internationalizing their operations, i.e., for the purpose of manufacturing internationally interchangeable components. The Brazilian example raises some important questions for ongoing research, which are not dealt with systematically in the study under review:

- What are the implications of flexible automation for the international division of labour in automobile production?
- How to assure the international competitiveness of newly industrializing countries in automobile production? In which areas of the motor vehicle industry should countries such as Brazil specialize?
- Which role should governments play in newly industrializing countries in dealing with the social implications of the microelectronic technology and in creating alternative employment opportunities?
- What are the relative merits and drawbacks of the Brazilian vis-à-vis the Korean approach in developing a domestic automobile industry (multinational versus indigenous producers)?

The study edited by Watanabe does not support the widespread view that the "microelectronic revolution" renders automobile production in newly industrializing countries obsolete. But even if the diffusion of flexible automation proceeds more slowly than anticipated, this may provide only short relief for automobile producing countries in the Third World. In the medium run, new technologies may threaten to retard the relocation of automotive industries to lower-wage locations. What are the strategic options for Brazil and other new competitors in world automobile markets? Some observers argue that these countries are forced to conform to the latest technological norms set by the industrialized countries to remain or become competitive internationally.[1] Alternatively, it is argued that a comprehensive application of flexible automation of the latest design in economies such as Brazil would seriously conflict with these countries' comparative advantages.[2] This is mainly because of the relatively poor endowment with human capital.

The study under review implicitly supports the latter view: Even in the industrialized countries the lack of adequately skilled manpower is shown to be the biggest problem in applying microelectronic production technologies. Moreover, the country studies suggest that technological change affects the various areas and processes of automobile production to different degrees. It is rather unlikely that countries such as Brazil can compete in world markets successfully with automotive goods in the production of which flexible automation will figure prominently in the future. But standardized production in the automobile industry is not rendered obsolete by ongoing technological innovations; especially in the production of various autoparts and components it is likely to remain crucially important. Further standardization may also be achieved in the production of commercial vehicles, utility cars, and passenger cars belonging to the small or mini-size segments of the market. Here, the comparative advantages of newly industrializing countries may be found, and the dilemma to identify products suited to local needs that also have export potential may be overcome.

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[1] See e.g. Daniel T. Jones, James P. Womack, "Developing Countries and the Future of the Automobile Industry". World Development, Vol. 13, 1985, pp. 393–407.

[2] See e.g. Bernhard Fischer, Peter Nunnenkamp et al., Capital-Intensive Industries in Newly Industrializing Countries. The Case of the Brazilian Automobile and Steel Industries. Kieler Studien, 221, Tübingen 1988.

It largely depends on the domestic economic policy framework whether or not the production and employment opportunities in the automotive industries will be fully exploited by newly industrializing countries. The most efficient way to achieve or maintain international competitiveness is to allow for an intra-industry specialization in production and trade that reflects the comparative advantages of the country. As concerns employment, the policy focus should be on how to encourage the creation of new jobs and skills, rather than to fight against automation in order to prevent displacement effects. However, in newly industrializing countries this objective can hardly be achieved by establishing an indigenous electronics industry through import protection. In view of the evidence presented by Tauile, it is difficult to understand why "the Brazilian government's technology policy, the protection granted to parts of the electronics sector, is a positive example" [3]: Due to the protection granted by the "Lei da Informática", NC machine tools produced in Brazil cost two to three times the price of their counterparts in the world market. In this way, some new jobs may be created in the electronics industry. But the users of electronic items, most notably the automobile industry, suffer from substantially higher input costs so that their international competitiveness is eroded and employment is affected negatively. Specialization according to comparative advantage would rather require to allow for the import of automotive inputs at world market prices.

As is evident from the above reasoning, the study edited by Watanabe is most useful in two respects. First, it convincingly challenges the widespread doomsday scenarios developed in the aftermath of the "microelectronic revolution". Second, it gives reason to reconsider the role of newly industrializing countries in the international division of labour in automobile production and in other capital-intensive industries.

Peter Nunnenkamp

[3] Cf. Hubert Schmitz, Ruy de Quadros Carvalho, Automation and Labour in the Brazilian Car Industry. Institute of Development Studies, Discussion Papers, 239, Brighton, December 1987, p. 38.