

S
UFRJ/IEI
TD53

043935-5

TEXTO PARA DISCUSSÃO

TEXTO PARA DISCUSSÃO Nº 53

TECHNOLOGY AND LABOUR
UTILISATION IN INDUSTRY

Haberé Schwitz

Setembro de 1984

Instituto de Economia Industrial
Universidade Federal do Rio de Janeiro

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO
INSTITUTO DE ECONOMIA INDUSTRIAL

TECHNOLOGY AND LABOUR UTILISATION IN INDUSTRY

Hubert Schmitz

Setembro de 1984



43 - 016385



INSTITUTO DE ECONOMIA INDUSTRIAL

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO

AV. AVENIDA

AVENIDA

AVENIDA

AVENIDA

Este trabalho foi impresso
com a colaboração da ANPEC
e o apoio financeiro do PNPE



PESQUISA E DESENVOLVIMENTO

FEA - UFRJ
BIBLIOTECA

Data: 11/10/84

N.º Registro: 043535-5

NS 98295

S
UFRJ/IEI
TD 53

FICHA CATALOGRÁFICA

Schmitz, Hubert.

Technology and labour utilisation in industry.

--Harmondsworth: University of Sussex, Institute of Development Studies, 1984.

10 p. -- (Texto para discussão, n.53)

INTRODUCTION

UFRJ / FEA - IEI
BIBLIOTECA

This paper summarises the main points from a study on technology related patterns of employment in manufacturing industry.** Interest in this question was triggered by observations made during factory visits and discussions with managers in the Brazilian textile industry. These revealed that the technologically most advanced firms preferred production workers without previous experience in this industry. This policy seemed particularly puzzling in areas which have a long tradition of textile production and a surplus of labour with practical experience in the industry. At the same time both government and employers continued to refer to lack of education and skills as one of the main bottlenecks to industrialisation and the absorption of modern technology.

The research compares firms which are technologically very advanced with firms which use less sophisticated machinery and equipment, and analyses how technology shapes their demand for labour. The study is concerned with the impact of technological change on the utilisation of labour in terms of number of jobs, recruitment, training, skill requirements, labour turnover, wages and internal mobility; it also investigates the impact on the utilisation of external labour in the form of sub-contracting of small producers and employment of outworkers.

The work is prefaced by a review of the literature. On the question of how technological change affects the utilisation of labour only one thing seems to be clear: it is labour saving;

** Technology and Employment Practices: Industrial Labour Processes in Developing Countries, Croom Helm, London, forthcoming.

the innovation generally reduces the number of workers per unit of output in the branch where it is applied. When it comes to the question of how technological change affects the type of employment, contradictory views are apparent.

The scenarios found in the literature range from:

- a) the 'post-industrial society', in which sophisticated technology absorbs all routine activities into the machines and requires high degrees of skill, commitment, and autonomy from a stable, well-paid workforce, to
- b) theses about the continuing degradation of work in the 20th century world, in which a major concern in the devising of technological innovations is to de-skill the jobs, turn them into calculable and standardisable routines, so that labour becomes more easily replaceable and cheaper.

Of course these represent the extremes in the employment literature. Between them are various theories which posit a segmentation of labour markets as a result of technological development or of management's attempt to achieve control over the production process.

The main problem is that there is a wealth of studies on the advanced countries, but little which deals explicitly with technology related patterns of employment in developing countries, which may be distinctively different. The debate in the advanced countries always centres on the impact of new technologies upon an existing situation. In less developed countries, the technology is often the same, but the existing situation rarely is, a difference which gives rise to new questions. It also explains why modern technology in developing countries is often associated (at least implicitly) with a privileged workforce, ie higher skill requirements, better wages and greater stability.

Research methods and data

In the main body of the work, these issues are examined empirically, starting from the assumption that the impact of technology on labour varies between different categories of labour and different industries. Four industries are investigated which are thought to represent different stages of technological development: (1) the production of chemical fibres, (2) cotton spinning and weaving, (3) clothing manufacture and (4) the production of hammocks. These industries are examined on the basis of factory visits, interviews with owners/managers of firms, and information from their personnel departments, as well as from trade unions, machinery suppliers and secondary sources. This data is supplemented, in the case of the spinning and weaving industry, by a study of 'hypothetical factories' at 10 year intervals between 1950 and 1980. These model factories are assumed to use the most modern technology available in the respective years, so that trends (or potential trends) in labour productivity, efficiency of machines, capital-labour ratios, number of spindles or looms per worker, labour force composition and skill requirements can be calculated. This 'relative information' can be contrasted with what really happened in the economy; the use of hypothetical factories serves to clarify the actual trends in labour utilisation and to provide grounds for assessing the relative importance of technology. While the empirical focus is on four specific Brazilian industries, the implications are thought to be of interest to developing countries in general.

Classification of technologies

The categories for assessing the way in which technologies influence labour utilisation are drawn from the history of industrialisation and technological development itself. The four industries chosen represent four broad stages: first, when workers are brought together either under one roof or through the putting out system, without altering the existing technology; second, when the tasks are divided and specialised tools developed; third, the development of machinery and the subordination of the worker to it; and finally, the emergence

of continuous automated production, in which the worker's main task is to monitor the machines.

It is implied neither that any given industry is technologically homogeneous - the industries considered here contain firms at different stages of technological development, nor that all industries go through all stages. Synthetic fibre production, for example, was 'born' in stage four, the clothing industry is still at stage two, and cotton spinning and weaving, which did develop from stage one to three, has been only partially successful in reaching stage four.

From the point of view of the conclusions of the study, and particularly those dealing with policy implications, it is probably stages three and four which receive most attention and shed most light on contemporary developments in skill levels and wage rates in industry. Stages one and two, on the other hand, provide a useful framework as they stand to shed light on an important feature of industrial organisation in developing countries - the persistence of outwork.

Putting out: past or present?

The practice of farming out parts of the production process is much neglected in empirical research, even though in some branches the number of people earning their livelihood as disguised wage workers is considerable. The case studies serve as a reminder that this form of labour utilisation continues to be important. The most obvious reason why the use of external labour is most common in stages one and two is purely technical. In production of synthetic fibres or cement, for example, farming out is a technical impossibility due to the continuous nature of the production process. Thus stage four eliminates the possibility of subcontracting, unless for ancillary operations.

However, technology does not explain the whole story. Fluctuations in demand and marketing channels go a long way to explaining the other half. The clothing industry

shows this very clearly. From a technological point of view, all clothes could be produced in a putting out system, but typically it is found in those for which demand is most volatile and distribution channels are diffuse. For the same reason large capital keeps out of such lines of production leaving the field to small capital which is generally more efficient in coping with the required flexibility and in farming out the production process, not least because often the cooption of external labour takes place in the twilight between legality and illegality.

Skills and Control

As regards skills, the Brazilian case studies show three trends:

1. The necessary training time for most shop floor workers decreases. (This came out most clearly where spinning and weaving mills at different technological levels were compared; here the de-skilling was undoubtedly an outcome of technological change. In the clothing industry, it was more a result of changes in the organisation of the workprocess.)
2. There is a progressive concentration of know-how and skill in a small group of managerial and technical workers.
3. However, the number of de-skilled workers (see trend 1) falls at a faster rate than that of managerial and technical workers; hence in relative terms the skilled component of the workforce increases, while a (shrinking) majority of workers suffers a process of de-skilling.

Such findings (especially trend 1 and 2) are well known from research carried out in advanced countries. This study suggests however that the process of destruction of old skills and creation of new skills is often different in developing countries. The former is different because their industrial base is younger; as modern industry is often newly implanted in developing countries (in the course of import substitution), certain skills never existed within their labour force; hence it does not always make sense to

talk about de-skilling. The latter is different, because the creation of new skills is most pronounced in those industries which develop and produce the new technologies and these are generally not located within less developed countries.

The concern of employers with control over the labour process surfaces in a number of circumstances as a decisive factor in explaining their policies towards labour. It came out most clearly in the preference of the advanced textile and clothing firms for unskilled workers. Unless one understands management's concern with discipline and precise execution of tasks according to instructions, it is hard to understand this policy. It only becomes feasible because modern technology and methods of work organisation considerably lower training requirements. However, advanced machinery and work organisation are only a necessary, not sufficient condition. For the above policy to work, careful selection and training procedures need to be followed, which in return require specialised staff and facilities to carry this through. Such an apparatus is only economical for large enterprises. Thus it is concluded that, since skill requirements have decreased with technological modernisation, large-scale firms find that higher training costs incurred by recruiting young unskilled workers are outweighed by gains in discipline and control over labour in the workplace. Again however the distinctive conditions of the developing countries are emphasised and it is suggested that the control aspect of technology has three dimensions which make it different from in the advanced countries: (1) technology is generally imported, (2) the labour surplus is greater and (3) trade union power and labour resistance at shop-floor level is weaker.

Labour turnover, wages and reliability

As regards the impact of technical change on wages, the study shows two directions which run contrary to each other. On the one hand the limited training required under modern technical conditions makes the worker more easily replaceable and thus exerts a downward pressure on wages in some industries.

In the textile industry, it certainly kept wages from rising in any significant way, even though substantial modernisation of equipment occurred and even though considerable gains in labour productivity were achieved. On the other hand lies the experience from continuous process production, where employers' attitudes towards wages and turnover are markedly different. The chemical fibre industry reveals low turnover rates and relatively high wages and fringe benefits. The explanation cannot be found in high skill requirements; firms give operators a training time of three to six months to satisfy their standards of job performance. The reason lies in employers' concern with reliability. The continuous nature of the process means that breakdowns and interruptions are more costly than in processes lower down the technological scale which are of a discontinuous nature. Thus wages and employment conditions come to be determined primarily by factors endogenous to the firm and less by labour market conditions.

If the pattern of labour utilisation found in the chemical fibre industry is management's rational response to new technological conditions, does this industry portend future conditions of work and employment? The answer would seem to depend on two questions. First, how pervasive is the trend towards automation? Undoubtedly there is a long run tendency for industrial production to move up the technological ladder (towards stage four of the labour process classification). The advent of micro-electronics speeding up this process, but their role in developing countries is still unclear. The second question is whether automated production, where it occurs, always increases the importance of the reliability factor. Even though the expectation might be that improvements in automatic processes would eventually eliminate the areas of uncertainty and so reduce responsibility, each advanced stage of automation brings its own technical problems and potential for breakdown requiring human monitoring and intervention.

Inasmuch as the reliability or efficiency wage becomes reality, it has far reaching economic consequences. In essence, this possibility breaks the link between flexible wages and employment

creation and therefore severs the connection which establishes the market's supposed tendency towards full employment. In doing so, it destroys the very argument on which the defence of the market's social function rests.

Some policy implications

Some policy implications are general, others are specific. At the most general level, it must be emphasised that advanced technology cannot be equated with privileged jobs. Intra-industry comparisons in the textile and clothing industry revealed that it is rarely an advantage to work in an advanced technology factory. If anything, work is more repetitive and strenuous. Pay is sometimes a little better, but not always. Labour turnover is considerable. Certainly, any expectation that technological modernisation would soon solve the problem of low-paid and unstable work conditions must be considered ill-conceived. A crucial factor is that in industries such as textiles and clothing, more modern technology tends to make it easier to substitute one worker by another. Hence the need for protection through legislation which improves job security and remuneration is no less urgent in technologically advanced firms.

There are however, certain kinds of advanced technology, most notably continuous process production, where replacing one worker by another presents problems; not because of high skill requirements, but due to the importance of dependable work performance. The evidence from the case studies is only indicative, but policy makers should accustom themselves to the idea that under certain technological conditions, it is 'efficient' for employers to offer a package of employment conditions better than what the law or the labour market demands. This package, including the wage, is explained endogenously and hence is not susceptible to government policies. In particular, general government policies which seek to influence employment or competitiveness by reducing wages and curbing trade union power would be futile for these industries. Future research will have to assess whether the reliability wage effect can be expected to occur in all forms of automated production and

whether the continuous nature of the process is a decisive criterion. Whatever the precise outcome of such research, it seems certain that the whole complex of modern technology and employment conditions needs disaggregating, before any useful conclusion about the desirability or consequence of government action can be made/predicted.

Policy implications of a more immediate practical value lie in the field of vocational training. Employers' complaints about the lack of trained workers are world wide and too often governments are 'invited' or 'bullied' into supporting industrial training, all in the name of economic growth and paving the way for modern technology. In evaluating such requests, it is necessary to exercise great scrutiny. At the risk of over-simplification, the following guidelines are suggested.

Do not subsidise or become involved in vocational training for machine operators and auxiliary workers. The training required to exercise the jobs is short and the more modern the technology, the shorter the training necessary. If employers were interested in skills themselves, surely they would not avoid the recruitment of workers who have previously worked in other firms (as they do). If training costs are high due to excessive labour turnover, the solution must be sought elsewhere, not in government support for this kind of training.

For maintenance workers the recommendation would be different. The research revealed that in proportional terms their importance increases, but opinions were divided as to whether the length of necessary training time would increase. Whatever the answer, occupations such as mechanics, electricians and electronics servicemen, require a relatively comprehensive training, which in its basics is common to all industries. This is an area of training for which there is a great need and in which government must provide support. The Brazilian vocational training service for industry (SENAI) already has a

training programme for these occupations, but in the course of the research it became apparent that it is not sufficient.

Finally, some implications for employment oriented project evaluation are drawn out. Employment policy, in order to be effective, has to be linked to the provision of government incentives. However, the government bodies examining industrial projects generally lack information on the amount and type of employment which can be expected from investment in determinate industries. Since the amount of research which can be carried out in the evaluation of projects is limited, sectoral studies on technology related patterns of employment are important in providing the analyst with a theoretical and empirical framework for his/her project specific work.

PUBLICAÇÕES DO IEI EM 1984

TEXTOS PARA DISCUSSÃO

	Nº de páginas
42. ARAUJO JR., José Tavares de. <u> Mercados contestáveis e concorrência Schumpeteriana nas economias de industrialização recente</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 42).	42
43. ALMEIDA, Julio Sérgio Gomes de. <u> A crise no mercado paralelo de letras: causas e consequências sobre a reforma financeira de 1964-66</u> . IEI/UFRJ, Rio de Janeiro, 1984. (Discussão, 43).	24
44. FIORI, José Luís. <u> Por uma economia política do tempo conjuntural</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão,44).	67
45. PENA, Maria Valéria J. <u> Operárias e Política Operária (1900-1920)</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 45).	21
46. ZONINSEIN, Jonas. <u> Capital financeiro, demanda efetiva e causas da crise</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 46).	25
47. HOBDAY, Mike. <u> The brazilian telecommunications industry: accumulation of microeletronic technology in the manufacturing and services sectors</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 47).	69
48. ERBER, Fabio Stefano. <u> The capital goods industry and the dynamics of economic development in LDCs - The case of Brazil</u> . IEI/UFRJ. Rio de Janeiro, 1984 (Discussão 48).	42
49. CASTRO, Antonio Barros de. <u> Ajustamento & adaptação estrutural: a experiência brasileira</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 49).	19

	Nº de páginas
50. GUIMARÃES, Eduardo Augusto. <u>The activities of brazilian firms abroad</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 50).	97
51. ARAUJO JR., José Tavares de. <u>Eficiência e acumulação de capital: Notas sobre a hipótese de Hirschman</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 51).	16
52. ALMEIDA, Julio Sergio Gomes de. <u>Consequências financeiras do monetarismo</u> . IEI/UFRJ, Rio de Janeiro, 1984 (Discussão 52).	52

UFRJ / FEA - IEI
BIBLIOTECA