

On the following pages you will find a reprint of the *expert comment* article from our first issue back in April 1995. While this seems quite a long time ago, this article still fascinates with a stunningly clear analysis of the late

20th century. The literature may be a little outdated, but follow his thoughts and you will find that things haven't changed that much.

To give you an impression of 1995 when reading this reprint we reproduced the layout of work at that time. Unfortunately, the then used hyphenation rules are no longer available in our typesetting system, so we use the modern, more free system that is common today. Enjoy!

Structural Change in Employment

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1 Statistical trends

In all industrialised countries (OECD countries) the share of the agrarian sector in employment has decreased to a level below ten per cent since the early 70s. The share of the secondary sector has been declining continuously for more than a decade while the tertiary sector has been increasing its employment share. This share accounts meanwhile for between 60 and 70 per cent in the more developed countries.

A similar trend is also true for a number of industrialising countries in South and East Asia (SEACountries: Hong Kong, Indonesia, Malaysia, the Philippines, Singapore, South Korea, Taiwan, Thailand). Although in these countries the employment share of the agricultural sector is still relatively high (about 50 per cent) the share of the industrial sector, which increased until the early 1980s, has been declining since that time in favour of the service sector. Its share amounts to about 35 per cent.

In addition to the sectoral shifts, a change in employment structure can be observed within the industrial sector as well: there has been a decline in 'manufacturing' employment and an increase in service employment. As a consequence, many of these activities are supplied by independent firms and are therefore classed as belonging to the service sector. Taking the increase of service activities within the industrial sector into consideration, the shifts in employment can be better observed through the change in the occupational structure of employment.

Service activities represent an inhomogeneous field and it is not easy to find a common definition. A common feature is that they do not fit the job profiles in agriculture, extraction, manufacturing and construction. One way would be to use a functional classification, i.e. to relate the activities to the function which they have for their addressees. From this point of view we can distinguish distributive services, producer services, social services and personal

services. One can obtain a lot of interesting information from observing the development of services in relation to long-term economic development. There has already been a considerable share of certain personal services in pre-industrial (agrarian) societies. Whilst distributive services (e.g. transportation, wholesale and retail trade) and producer services (banking, credit, insurance) already began to develop at an early stage of industrialization, it was not until the end of the Second World War that the growth of the service sector centered on research, information, education, medical and health services.

2 Reasons for structural change

In the following chapter the processes which give rise to changes in work and employment will be described in detail. For this purpose we use approaches developed by Joseph Schumpeter, Jean Fourastié and Daniel Bell. We shall add two important aspects: the internationalization of markets and competitive conditions; and the application of Information and Communication Technology (ICT) in processes related to production.

2.1 Market saturation

Market saturation, technological innovation and the reactions to these phenomena are central themes in the work of Schumpeter. He stresses their significance for the dynamics of the economic system. Fourastié notes the effects on employment caused by continuous productivity growth and market saturation. For Bell, research and science are the centre of economic and social development.

The central idea of the market saturation approach is that there are limits in the demand for consumer goods when a certain level of diffusion has been reached. As a consequence the diffusion process begins to stagnate. Firms can react to this phenomenon in different ways. Schumpeter stresses innovation. The best way to stimulate demand is to find a new key technology, which opens a large number of applications

with new functions, satisfying new needs. The diffusion of such innovations is a process with cyclical characteristics. During the introduction phase the diffusion process is often slow and hesitant because of problems with investment requirements and risk appraisal. Usually a rapid growth phase follows as more and more firms exploit the new opportunities. They imitate existing products or develop new applications, and investment increases. This phase of rapid growth has a positive effect on employment. At some stage of the growth process, however, the opportunities of the technology are exhausted and market saturation is reached. The intensity of competition increases, profit margins erode, investment decreases, and cost pressure rises. Employment is reduced by rationalisation measures and productivity growth. Search for a new key technology starts again. This is the way Schumpeter interprets the Kondratieff cycles, which have a period of about 50 years. Economic disequilibrium and problems of structural adjustment are regular for two reasons: the innovations are not distributed evenly throughout the economy, and the possibility of their exploitation usually concentrates on several branches; and innovations have a cyclical character.

Following Schumpeter's approach, scientists stressed that the process of innovation is not confined to technology and the related technical components (plant and equipment, raw materials). All basic innovations (railways, electricity, the combustion engine, and the like) were accompanied by far-reaching changes in society. Simultaneously with the technological innovations there was a change in organization and management systems, industrial relations, social structure, skill requirements, political systems, and culture in general.

There are also less radical modes to stimulate demand than the systematic search for innovations on the basis of a new technology. These modes relate to strategies that are aimed at improving traditional products or differing from compe-

titors (different models and versions of a product, special design, customer-oriented manufacturing and the like). In this way demand can be stimulated and enterprises can try to secure their market share or to increase it.

It is of great importance for the question of economic development and employment whether key innovations inducing growth effects are frequently possible or not. Chris Freeman and Luc Soete give an affirmative answer. At present they see such a technology in computer-aided ICT. They see the reason for the fact that ICT has not stimulated economic growth and employment so far in the lack of social institutions needed for successful development and diffusion of this new technology. To such an institutional framework belong: an education and training system; industrial relations; organization and management structures; combined private and public investments; and labour market policy measures. A 'mismatch' between institutional framework and the requirements for developing the technology and realizing its productivity advantages is a barrier for diffusion and causes stagnation.

One can agree with Freeman and Soete that a good match between technological paradigm and institutional framework is a necessary condition for development, but the authors do not prove on the empirical level that a mismatch exists. One could find other reasons, too. Often electronics either substitute for mechanical components and appliances (e.g. typewriter, calculator, telephone exchange facilities) or are additive components for traditional systems (e.g. machine tools, cars, household appliances, consumer electronics). A lot of new electronic appliances have indeed been developed, but the manufacturing process is both labour saving and capital saving. Additionally, the application of ICT does not need large investment sums for extracting and producing raw material or for developing a new infrastructure, as was the case with the investments required for railways, electricity supply, and vehicular traffic. The infrastructure necessary for ICT does not require a great deal of work because of the high technical level which has been reached at present. Existing infrastructure can often be used (e.g. a telephone network). The positive employment effects caused by ICT belong to the area of research and development. In contrast, ICT as a rationalisation measure results in a relatively large labour saving, not only in the area of manufacturing but also in the planning departments, offices, administration, banking, and insurance companies.

Although ICT leads without doubt to structural change in employment, it is questionable whether labour saving effects are compensated by the positive employment effects.

Jean Fourastié is rather critical of the view that economic growth can be constantly repeated by introducing new technologies. He claims an absolute limit in the demand for physical goods and interprets this limit in a positive sense as an opportunity for social development. Apart from the production of physical goods, a characteristic feature of the secondary sector is the production of technologies serving the purpose of enhancing productivity in both the primary and secondary sectors. Continuous productivity growth has two effects: it causes in conjunction with saturation a permanent employment decrease in both sectors; and simultaneously productivity growth reduces the level of prices (or increases the level of real income). It is this second effect which stimulates the demand for personal services. According to Fourastié, the absence of saturation and impossibility of applying technology are characteristic features of services. This is the reason why the tertiary sector absorbs more and more employment and becomes the largest sector in the economy.

As the production of physical goods is limited, producer services and distributive services are limited as well. The real area of growth within the tertiary sector is therefore that of personal and social services (e.g. tourism, education, health, culture). This is the weak point of Fourastié's approach. The last 20 years show that the development of personal and social services has lost its dynamic. There is a major problem in financing the demand for these services. Some of the personal services (e.g. tourism, entertainment) are demanded directly by consumers, whilst for others (education, health) demand is instead stimulated indirectly via tax and contributions and is therefore accompanied by an expansion of welfare state benefits. Perhaps economic development has stabilised at a secondary sector share of 30 to 40 per cent.

This leads to another problem: the question whether technology is applicable to the field of service activities. As we see, ICT has become an important technology within the tertiary sector for processing data and information. This is relevant for all services. Fourastié published his book in 1949 and conceded that his theory had to be revised if a new technology appeared which benefited planning activities and

processes of thinking and communication.

Unlimited diffusion of activities could be imagined in the area of culture, the arts, and political participation in all areas influencing people's interests. However, the problem in financing these activities is even greater than it is in relation to social and personal services. It is not possible to measure their productivity and they cannot be economically organized. Therefore, an alternative mode for distributing national product and income had to be found to permit such a development.

Daniel Bell also places technological progress at the centre of his analysis, but he differs from Schumpeter in that he does not observe this development only as a cyclical process of inventing and exploiting key technologies. He argues that the innovation process changes its character and influences the social structure, politics and culture. The processes of inventing and innovating have been put on a scientific basis and this change leads to scientific treatment of the production process, technical development and the shaping of social relations. In consequence sciences, research, education and training, health services and government are growing fields of activities and new technologies are used more and more to plan economic and social processes (computer technology and scientifically based methods of analysis, e.g. simulation, system analysis, decision-making theory). The most important problems in this respect are the organisation of the scientific system, financing it and the subordination of science to the relevant political system. Scientists and qualified engineers, being involved in economic and political decision-making, form a new social class as opposed to the class of people excluded from these activities. One can agree with Bell that the sciences as the central element of economic and social development form an important characteristic feature of industrialized societies. However, his approach does not take into consideration that the global information systems and mass media influence political consciousness and thought. Altogether, we have a picture of social development consisting of the following elements: key innovations; market saturation for physical goods and productivity growth in all economic sectors; and the increasing importance of sciences, research, and social planning. However, we should be skeptical of Bell's and Schumpeter's optimistic view that key innovations can regularly be exploited in such a way that employment is stimulated. We also have good reasons for being skep-

tical of Fourastié's assumption that there are no limits or problems for an increase in social and personal services.

2.2 International trade and employment

A new strategy of competition which could be called 'competition by innovation' pushes traditional strategies into the background, once existing technologies have reached the stage of market saturation. As the limit of saturation depends to a certain degree on the level of real income (price elasticity), cost reduction of production may reduce the level of prices and stimulate demand. Cost reduction can be achieved by rationalisation measures (organisational and technical improvements). These possibilities are, however, exhausted since mass production has been introduced in traditional industries (Fordism).

An option which has become more and more popular in recent years consists of shifting certain areas of production activities to low-wage countries. The possibility of relocation depends on the technical level required for the production process and on the level of skills available in low-wage countries. The areas of the production process requiring a high technical level (research and development, technical planning) and the economic decision-making process remain in the highly industrial countries. Since the collapse of the socialist system a number of additional countries in Eastern Europe were added to the list of countries for relocation purposes. These countries, and also many so-called industrialising countries in South and East Asia (Hong-Kong, Indonesia, Malaysia, Philippines, Singapore, South Korea, Taiwan, Thailand, and recently China) have an industrial infrastructure that is more or less well developed, have a relatively high level of human capital and are enhancing their international competitiveness, in particular with regard to medium- and low-wage goods.

Freeman and Soete have shown in detail that these industrialising countries are becoming an autonomous force and do not only serve as a place for relocating by firms of industrialized countries. Competition with these countries has increased continuously over the last years, and their economic development indicators (growth of production, productivity and employment) have significantly exceeded those of all industrialised countries since the middle of the 70s. Exports from this group of countries have risen by 300 per

cent in the 80s, productivity levels have come close to those of industrialised countries, whilst wages have stagnated. This is the reason why the pressure on industrialised countries continues to lead to the relocation of areas of industrial production to industrialising countries. Freeman and Soete calculate a so-called delocation pressure index by comparing the ratios of labour costs and labour productivity. The result is that in the period between 1975 and 1990 the pressure to relocate production processes to SEA countries has risen by about 50 per cent for Japan, 100 per cent for the USA, and 200 percent for the EU. The extent of relocation has also increased between the European countries during the last decade - within the European Community from high-wage to low-wage countries, and since 1990 to the Eastern European countries as well. This shift has been accompanied by the development of global groups of companies and deregulation of international capital flows.

Freeman and Soete stress that ICT makes certain services tradable. Traditionally, a close connection between producer and consumer is a characteristic feature for many service activities, whilst ICT separates production and consumption. ICT enables the producer to store, gather, process, sort, and distribute very different kinds of data. In addition it cuts down geographical distances and storage permits the use of information in the future as well. These opposing processes (separation of production and consumption, shortening of geographical distances) are the reason for the relatively recent phenomenon that service activities are being relocated to industrialising countries (programming, simple clerical functions, reservation and booking). Market saturation influences many firms to enlarge the markets for their products and to enter into strategic alliances with other companies. This process is promoted by establishing regional trade blocs, accompanied by direct foreign investment in these blocs (EU, Pacific basin area, American trade bloc). Increasing expenditure on research and development as well as on modern plant and equipment creates the necessary conditions for enlarging the markets in order to, at least, maintain the volume of production and sales.

2.3 Application of ICT in the production process

ICT is increasingly being employed in the production process for different reasons. Administration and office work have

been neglected until now as areas for rationalisation measures. Computer-aided ICT changes the situation radically and makes enhancement of productivity possible. An additional field for application of ICT is rationalisation of manufacturing in a traditional sense. Here, however, the possibilities are almost exhausted. Nevertheless, ICT opens new opportunities in the fields of designing and drawing, planning, coordination and organisation. These include planning the process of manufacturing, control of raw material flows, supplying of intermediary products and holding them in store. In this way, the traditional rationalisation process (enhancement of labour productivity and saving of expense) can be continued. In addition, ICT helps to cope with the enormous number of tasks resulting from the growth of international trade and resulting from the process of 'competition by innovation' (developing new products, improving traditional products, manufacturing different models and versions of a particular product, special design, customer-oriented manufacturing).

The possibilities for applying ICT in the large area of services has been mentioned above. This technology is of a reflexive character: there is a trend to automate the processes of encoding and testing software; user-friendly and standardized software packages can be modified by everybody; and object-oriented procedures simplify and speed up programming activities. The implementation of user-oriented networks creates new opportunities for work organisation, e.g. geographical distances are no longer a barrier to cooperation.

3 Summary account of changes in work activities and employment structure

In the following passage the impact of changes mentioned above on work activities and the demand for skills and qualifications will be briefly described.

Searches for innovations and 'competition by innovation' cause an increase of activities in the area of research and development. The process of introducing new and modified products, manufacturing different models and versions of a particular product and customer-oriented manufacturing increase the volume of work in the areas of designing, planning of manufacturing process, logistics and coordination of the production process as a whole. Therefore the shift to 'competition by innovation' causes an increase of activities

requiring technicians, engineers and business managers for organisation.

Similar trends are caused by application of computer-aided ICT. It not only gives rise to displacement of labour by machinery, but leads also to a generation of activities of new kinds, so-called automation-specific activities. These activities comprise development of software and programming, maintenance, which is of great importance for the ability to function and, finally, activities which serve to pre-plan the complete production process in detail, technically and with regard to organisation. Simultaneously, the automation process displaces a large number of activities to machinery. This displacement concerns so-called routine activities such as handling and transporting workpieces, assembling as well as typing, sorting, searching, and processing data.

As a consequence of internationalisation of markets, areas of activities are growing that are related to business management (marketing, competition strategies, cooperation, strategic alliances). Increasing pressure on international division of labour, trade with final and intermediate products and relocation of plants causes an

increase in activities related to coordinating the production process with regard to time, space and technical requirements. Legal matters and problems concerning foreign languages and cultures are added to the list of management tasks. The process of relocation itself particularly affects activities in the areas of manufacturing and assembling of a rather low skill-level as well as, recently, activities in offices and software departments. Many of these activities are relocated to industrialising countries which have a relatively high level of human capital.

The figure below summarises the different effects of economic and technical development on the employment structure. This picture is relevant to highly industrialised countries only. One can see that, altogether, there is a shift away from un- and low-skilled workers and a trend towards an increasing proportion of medium- and highly-skilled employees including "information workers", technicians, engineers, business managers, and experts on organisation.

This is, however, not the complete result; it is only the outcome of the first run. Further shifts, although only a conse-

quence of this first change in employment itself, are not inconsiderable in respect of quantity. These shifts affect the education and training system. On the one hand occupations requiring higher education and training intensities gain share; on the other the permanent economic, technical and social development creates a high demand for training measures for employees in order to accommodate and specialise their knowledge and skills. Thus, the changes in occupational structure of employment require an increasing volume of education and training activities and this increasing volume contributes its share to the change in the occupational structure. Furthermore, one can conclude that the general higher level of education will stimulate the consumption of cultural and artistic products and that these areas of activities will increase. However, at this stage the influence of socio-economic development ends. Fresh impetus can be given only beyond the economic sphere by a development of the cultural system itself.

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Figure: Changes in Employment Structure

reason	areas of increasing activity	areas of decreasing activity
competition by innovation	research and development designing work planning production planning logistics organisation	
computer-aided production	software development programming production control work planning adjusting of machines maintenance	loading and unloading machines handling work pieces assembling activities handling information
international trade	marketing insurance transportation translation legal regulations	
relocation in low wage countries	organisation and logistics transportation	manufacturing and assembling office activities programming